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BETTER FRUIT

VOLUME XIV

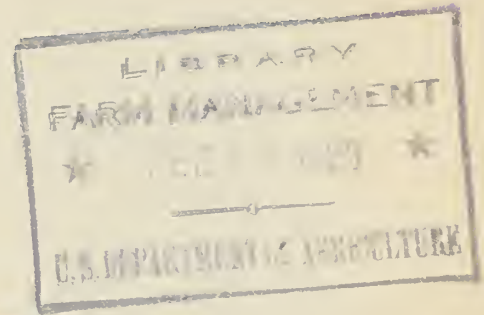
FEBRUARY, 1920

NUMBER 8

FEATURES IN THIS ISSUE:

Insecticides and Spraying
Oregon Cranberry Industry
The Use of Orchard Heaters
Winter-Injured Fruit Trees
Apple Pollination Studies

Brodie D. A.
Dept. of Agriculture
Comp



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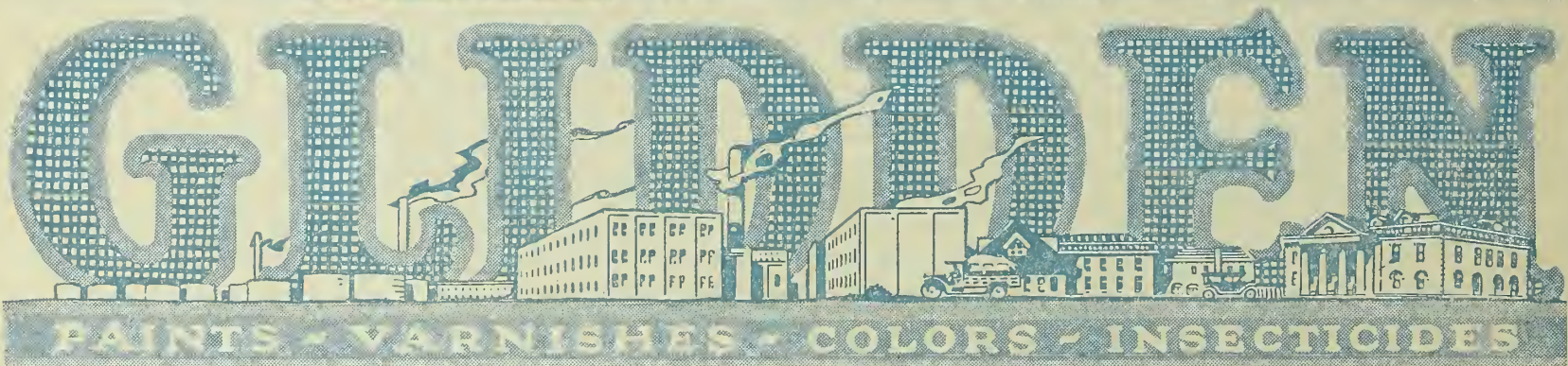
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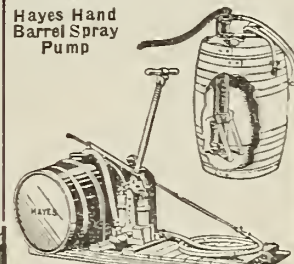
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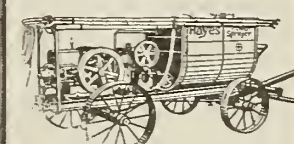
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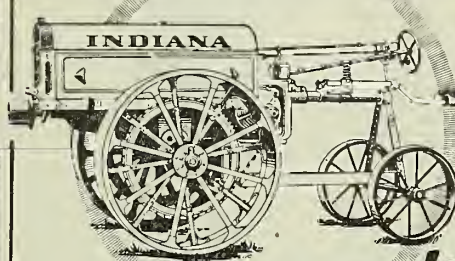
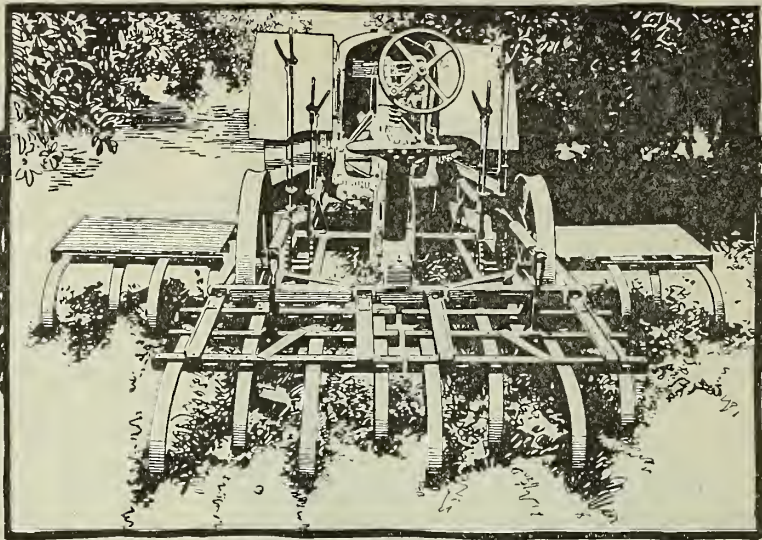
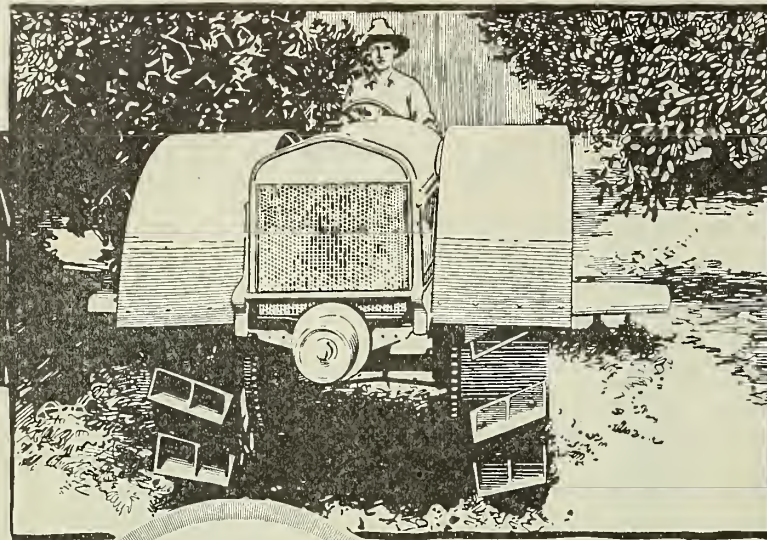
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NUMBER 8

Insecticides, Spraying and Fruit Insect Control

By A. L. Quaintance, Entomologist in Charge of Deciduous Fruit Investigations
and E. H. Siegler, Entomological Assistant U. S. Department of Agriculture

ORCHARDS and vineyards are usually troubled with different classes of pests, as biting insects, sucking insects and fungous diseases, each of which usually require for their control a different kind of spray material.

Combined Sprays.

Fortunately it is possible to combine the necessary materials for the simultaneous control of the pests, thus avoiding separate applications. In figure 1 are given the standard spray materials for chewing insects, sucking insects and the fungous diseases and the way in which they may be combined. It will be noted that there are three main divisions separated according to the principle stomach poisons in use: (1) Arsenate of lead; (2) Arsenate of lime; (3) Paris green. Each of these divisions is divided in accordance with the kind of fruit: Pome fruits, grape and stone fruits. These in turn are subdivided into sections: (1) Chewing insects; (2) chewing and sucking insects, (3) sucking insects, sucking insects and fungous diseases. These are further divided when a choice of spray material could be given. To make use of the diagram, the first consideration is the kind of fruit to be sprayed; next, the pests to be combatted; and finally the choice of the spray materials. In selecting the spray materials the specific recommendations as given elsewhere should be consulted.

If pome fruits, for example are to be treated for chewing insects, arsenate of lead, arsenate of lime, or Paris green may be used, but as will be seen in the latter diagram milk of lime should be added to the latter two. If stone fruits are to be sprayed for chewing insects, it will be noted that nothing but arsenate of lead combined with milk of lime should be employed. Again, suppose apple trees are infested with chewing and sucking insects and that arsenate of lead is selected for the former, it will be observed that this arsenical may be combined with soap, or nicotine, or nicotine and soap, or kerosene emulsion. If apples are to be sprayed for both chewing and sucking insects and also fungous diseases and arsenate of

lime is to be used for the chewing insects, nicotine should be added to it and also lime-sulphur or Bordeaux mixture.

Spray Dilutions.

Table I shows the amount of spray material required for a number of different quantities of sprays. The rate at which the materials have been computed will be found in the first column.



Small pressure tank type of sprayer.

The figures at the top of the table represent the total number of gallons of diluted spray desired, and the figures in the vertical columns give the amount of spray material required. Thus, if 150 gallons of arsenate of lead, paste at the rate of 2 pounds to the gallon, 50 gallons is to be used, it will be noted in the table that 6 pounds is required. If 25 gallons of self-boiled lime and sulphur mixture is needed, the table shows that 4 pounds of stone lime and

4 pounds of sulphur should be used. Again if 100 gallons of kerosene emulsion, 10 per cent strength, is wanted and the stock solution contains 66 per cent of kerosene, it will be found, by referring to the table, that 15 gallons of the stock emulsion should be used.

SOME IMPORTANT INSECTS AND THEIR TREATMENT.

APPLE INSECTS.

CONTROLLED BY WINTER OR DORMANT
TREE SPRAYING.

San Jose scale—The San Jose scale infests the trunk, limbs, and branches of most fruit trees—apples, pears, peaches, plums, etc. The mature scale is about the size of a pinhead, circular in outline, grayish in color, with a nipple-like prominence in the center. The bark of badly infested trees is ash gray, and when cut into shows a reddish discoloration. In the absence of treatment young trees are usually killed in two or three seasons, and the vitality of older trees is quickly impaired and eventually they are destroyed by its attack. It is usually controlled by one thorough spraying of the trees each year, preferably with lime-sulphur solution. Petroleum oil sprays also are used, but these sometimes cause injury to the trees and fruit buds. Fish-oil soap washes may be employed and these are convenient where only a few trees are to be treated. Badly infested trees should be sprayed in the fall as soon as the leaves are down, and again the following spring before the buds open. Ordinarily one treatment each year, preferably in the spring, will be sufficient, although thorough work is necessary to destroy the insect so that there will be no spotting of the fruit.

Oyster-shell scale—The oyster-shell scale is readily recognized from the resemblance of its scale, or covering, to a long narrow oyster shell. The female scale is about one-eighth of an inch long, in color brown to dark brown, though sometimes grayish in appearance. While less susceptible to winter treatments than the San Jose scale, the oyster-shell scale will be sufficiently controlled in orchards by the lime-sulphur solution employed for the former species. When infesting apple, pear, etc., it may also be treated with kerosene emulsion or lime-sulphur spray at summer strength when the young are hatching in the spring, which for any locality will usually occur during the period of one to three weeks following the blooming of the apple, or, in the case of the peach, with self-boiled lime-sulphur mixture in from two to four weeks following the blooming of the peach.

Scurfy scale—Although not often very injurious to orchard trees the scurfy scale is the subject of frequent inquiry from fruit growers and others. The treatment recommended for the San Jose scale will aid much in keeping this species in check, and it may be treated with dilute scale washes as the young are hatching in the spring, as just described for the oyster-shell scale.

Pear-leaf blister mite—The very minute creature known as the pear-leaf blister mite in recent years has become an important apple

	TOTAL GALLONS OF DILUTED SPRAY MATERIAL.									
	200	150	100	50	25	20	15	10	5	1
(a) SPRAY MATERIAL AND USUAL RATE OF DILUTION FOR TREES IN FOLIAGE.										
<i>Stomach poisons.</i>										
Arsenate of lead, paste, 2 lbs. to 50 gals.	8 lbs.....	6 lbs.....	4 lbs.....	2 lbs.....	1 lb.....	12.8 oz...	9.6 oz....	6.4 oz....	3.2 oz....	0.64 oz. or 1 teaspoonful.
Arsenate of lead, powder, 1 lb. to 50 gals.	4 lbs.....	3 lbs.....	2 lbs.....	1 lb.....	8 oz.....	6.4 oz....	4.8 oz....	3.2 oz....	1.6 oz....	0.32 oz. or 3 teaspoonfuls.
Arsenate of lime, paste, 2 lbs. to 50 gals.	8 lbs.....	6 lbs.....	4 lbs.....	2 lbs.....	1 lb.....	12.8 oz...	9.6 oz....	6.4 oz....	3.2 oz....	0.64 oz. or 1.5 teaspoonfuls.
Arsenate of lime, powder, $\frac{3}{4}$ lb. to 50 gals.	3 lbs.....	2.25 lbs..	1.5 lbs...	12 oz.....	6 oz.....	4.8 oz....	3.6 oz....	2.4 oz....	1.2 oz....	0.24 oz. or 2 teaspoonfuls.
Paris green, 6 oz. to 50 gals.....	1.5 lbs...	1.12 lbs..	12 oz.....	6 oz.....	3 oz.....	2.4 oz....	1.8 oz....	1.2 oz....	0.6 oz....	0.12 oz. or 0.5 teaspoonful.
<i>Contact sprays.</i>										
Nicotine sulphate (40%), 1 to 800= $\frac{1}{2}$ pt. to 50 gals.	1 qt.....	1.5 pts...	1 pt.....	8 fl.oz....	4 fl.oz....	3.2 fl.oz..	2.4 fl.oz..	1.6 fl.oz..	0.8 fl.oz..	1 teaspoonful.
Nicotine sulphate (40%), 1 to 1,066= $\frac{3}{8}$ pt. to 50 gals.	1.5 pts...	1.12 pts..	12 fl.oz...	6 fl.oz....	3 fl.oz....	2.4 fl.oz..	1.8 fl.oz..	1.2 fl.oz..	0.6 fl.oz..	0.75 teaspoonful.
Kerosene emulsion (66%), 10% strength.	30 gals...	22.5 gals..	15 gals...	7.5 gals..	3.75 gals.	3 gals....	2.25 gals.	1.5 gals..	3 qts.....	1.2 pints.
Fish-oil soap, 1 lb. to 4 gals.....	.....	.....	.....	12.5 lbs..	6.25 lbs..	5 lbs.....	3.75 lbs..	2.5 lbs...	1.25 lbs..	4 oz.
<i>Fungicides.</i>										
Lime-sulphur concentrate ¹ (33° B.), 1½ gals. to 50 gals.	6 gals....	4.5 gals..	3 gals....	1.5 gals..	3 qts.....	2.4 qts...	1.8 qts...	1.2 qts...	0.6 qts...	4. fl. oz
Bordeaux mixture (4-4-50); stone lime-copper sulphate.	16 lbs....	12 lbs....	8 lbs.....	4 lbs.....	2 lbs.....	1.6 lbs...	1.2 lbs...	0.8 lb....	.....	.....
Self-boiled lime-sulphur mixture ¹ (8-8-50); stone lime sulphur.	32 lbs....	24 lbs....	16 lbs....	8 lbs.....	4 lbs.....	3.2 lbs...	2.4 lbs...	.....	.....	.....
(b) SPRAY MATERIAL AND USUAL RATE OF DILUTION FOR DORMANT TREES.										
<i>Contact sprays.</i>										
Lime-sulphur concentrate (33° B.), 1 gal. to 8 gals.	25 gals...	18.75 gals.	12.5 gals.	6.25 gals.	3.12 gals.	2.5 gals..	1.87 gals.	1.25 gals.	2.5 qts...	1 pint.
Lime-sulphur concentrate (33° B.), 1 gal. to 9.5 gals.	21 gals...	15.75 gals.	10.5 gals.	5.25 gals.	2.62 gals.	2.1 gals..	1.57 gals.	1.05 gals.	2 qts.....	0.84 pints.
Kerosene emulsion (66%), 25% strength.	76 gals...	57 gals...	38 gals...	19 gals...	9.5 gals..	7.6 gals..	5.7 gals..	3.8 gals..	1.9 gals..	3 pints.
Kerosene emulsion (66%), 20% strength.	60 gals...	45 gals...	30 gals...	15 gals...	7.5 gals..	6 gals....	4.5 gals..	3 gals....	1.5 gals..	2.4 pints.
Fish-oil soap, 2 lbs. to 1 gal....	400 lbs...	300 lbs...	200 lbs...	100 lbs...	50 lbs....	40 lbs....	30 lbs....	20 lbs....	10 lbs....	2 lbs.

¹ Also serves as a contact spray during the summer season for newly hatched scale insects.

Abbreviations: oz.=ounce; lb.=pound; fl. oz.=fluid ounce; pt.=pint; qt.=quart; gal.=gallon. Weights: 16 ounces= 1 pound. Measures 7 teaspoonfuls=1 fluid ounce; 16 fluid ounces=1 pint; 32 fluid ounces=1 quart; 4 quarts=1 gallon.

NOTE—Chewing insects are such as the caterpillar, larvæ of moths and butterflies, beetles and their grubs, sawflies and larvæ, grasshoppers, etc. For these species of insects stomach poisons such as arsenicals are applied. Destructive forms of sucking insects are plant lice (aphids), San Jose and oyster shell scale, leafhoppers and the pear psylla. Contact sprays such as lime and sulphur are used to destroy this class of pests. These contact sprays largely kill by stopping up the breathing pores of these insects which breathe through their bodies.

in the early spring while feeding and egg laying, causing much of the fruit to fall or to become misshapen as it grows, thereby destroying or lessening its market value. In addition, the beetles, while feeding in the fall, excavate small holes or cavities in the ripening fruit, which favor its decay by fungi or other causes. The spray applications recommended for the

codling moth will aid much in reducing curculio injury to apples, although in the case of orchards in sod, or more or less grown up in or surrounded by weeds or other vegetation, sprays are not entirely satisfactory and these conditions should be corrected.

The apple maggot—The apple maggot, known also as the "railroad worm," makes discolored

pest in some localities. It is controlled by the dormant tree treatments recommended for the control of the San Jose scale (see under "Pear insects.")

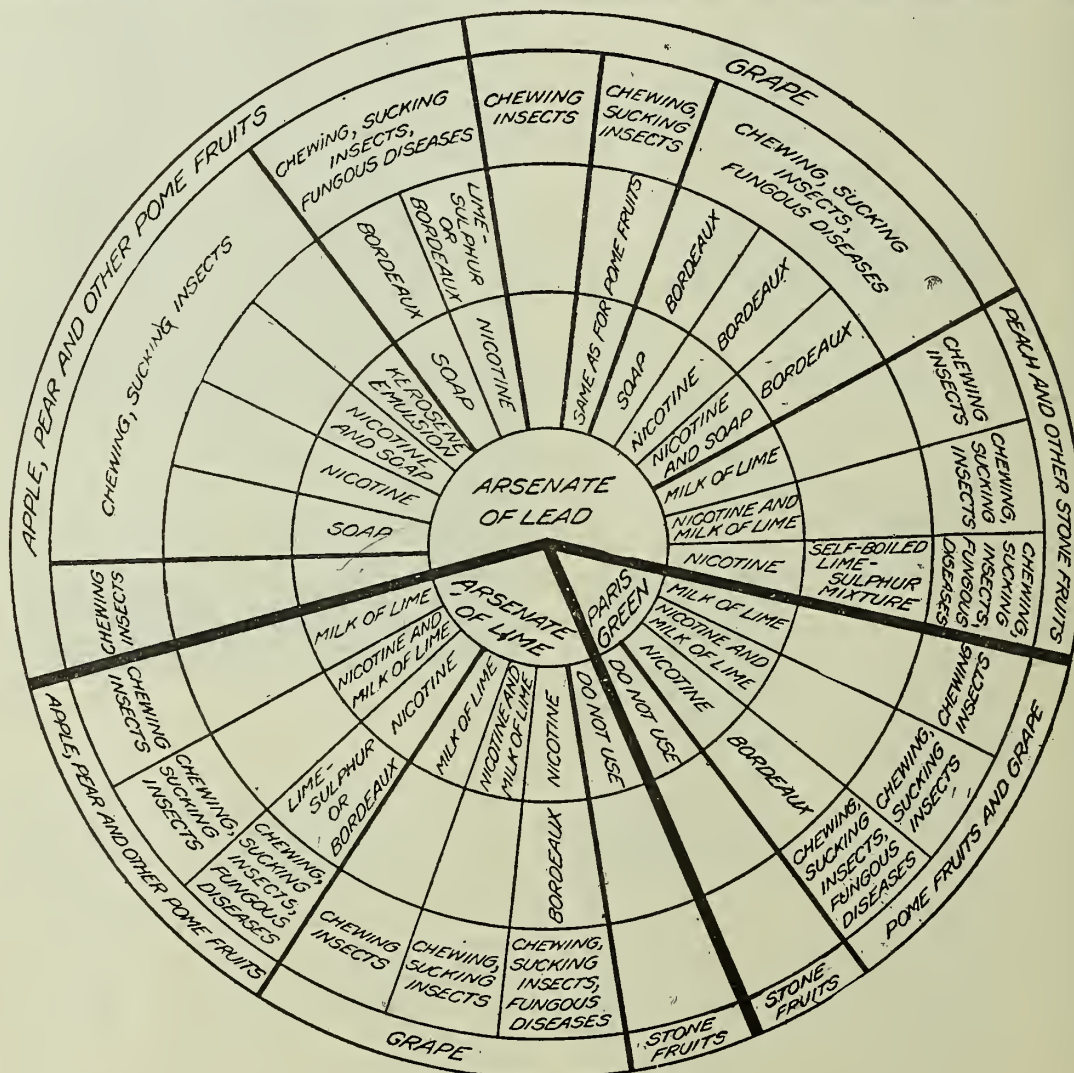
Apple aphids—Principally three kinds of aphids are important pests of apple foliage, namely, the rosy aphid, the green aphid, and the oat aphid. These are small greenish or pink plant-lice which curl the leaves or distort the fruit. They winter on the apple in the egg stage, the young hatching and congregating on the buds just as the green shoots are pushing through the bud scales. Thorough spraying at this time should prevent important injury later in the season. Forty per cent nicotine sulphate is used at the rate of three-fourths of a pint per 100 gallons of spray. If the dormant-tree treatment for the San Jose scale with lime-sulphur solution can be delayed until the buds are breaking, the scale and aphid treatments may be combined.

CONTROLLED BY SUMMER SPRAYING AND OTHER MEASURES.

Apple worm, or codling moth—The dirty white or pinkish caterpillar which feeds within the apple is known as the apple worm and the adult insect, which it develops, as the codling moth. The number of broods of larvæ each year varies from one to three or four, according to latitude and altitude. The insect is well controlled by the timely use of arsenical sprays, the number of applications varying with different regions. A spray schedule for apple orchards is given later.

Lesser apple worm—The lesser apple worm infests the fruit much as does the codling moth, but the burrows are not usually so deep, and it mines more under the skin in the calyx basin or on the sides of the fruit. The larvæ is smaller than that of the codling moth and is pinkish and fusiform. The treatments recommended for the codling moth will be effective in controlling the lesser apple worm.

Plum curculio—The plum curculio is one of the causes of knotty, deformed apples. The small snout-beetles puncture the young fruit



Showing what sprays may be combined and plants treated.

patches or winding burrows here and there in the flesh of the apple, and several larvæ in a fruit usually will reduce the pulp to a slimy brownish mass. The insect is more or less prevalent throughout the northeastern states. It prefers sweet and subacid varieties. Some experimenters have found that if the foliage and fruit are kept covered with a poison, such as arsenate of lead, during early July, the flies are destroyed before egg laying begins to any extent. Experience with this insect in Canada is to the effect that sprays regularly applied for the control of the codling moth and other insects will also control the apple maggot. In the home orchard and elsewhere care should be taken to gather up promptly and destroy wormy, fallen fruit.

Apple red bugs—The sucking insects known as apple red bugs came into prominence recently in New York state, Pennsylvania, and elsewhere. They puncture the little fruits early in the season, causing them to fall or become pitted and deformed. Best control comes from the use of 40 per cent nicotine sulphate, 1 pint to 100 gallons of spray, added to the first scab treatment before the blossoms open. It may also be necessary to add the nicotine sulphate to the first codling-moth treatment after the falling of the petals.

Bud moth—The caterpillars of the bud moth attack the opening buds of the apple in the spring, and it is particularly destructive throughout the northern United States, extending west to the Pacific coast. The dark brown caterpillars hibernate about half grown in little cases around the buds, and as the little leaves expand in the spring these are folded together by threads of silk and the caterpillars feed within the folded leaves. Injured leaves often turn brown, and if the caterpillars are abundant their work is quite conspicuous. During late summer the young larvæ of the new brood eat small holes in the apples, causing important blemishes. In seriously infested orchards a spray of arsenate of lead, 2 pounds of the powder (or 4 pounds of the paste) to 50 gallons of water or lime-sulphur solution, should be applied when the flower clusters are first in evidence. The arsenical in the first scab treatment just before the flowers are opened will effect further control. After the pest is well reduced the usual spraying schedule should keep it in check.

Cankerworms—The cankerworms are slender measuring worms, about 1 inch long when full grown, that feed upon the foliage of various fruit and other trees, but especially the apple and elm. The leaves are attacked shortly after they put out in the spring and may be quickly devoured, leaving the trees brown as if swept by fire. Orchards well sprayed as for the codling moth suffer little. Injury to young orchards can be stopped by spraying with arsenate of lead promptly upon first signs of injury. Cultivation of orchards during early summer destroys many pupæ in the ground. Large apple and shade trees may be protected by using bands of sticky substances, cotton batting, etc., around the trunk. For the fall cankerworm these bands should be in place in late fall (October), and for the spring form some four or five weeks before the buds are due to open.

Apple-tree tent caterpillar—In the spring the apple-tree tent caterpillars make their unsightly nests, or tents, in trees along the roadside, streams, neglected orchards, etc. The wild cherry is their favorite food, though numerous other plants are attacked when the caterpillars are abundant. They are rarely of much importance in well-sprayed orchards. The egg masses on the twigs should be searched for when the trees are leafless, and destroyed, and in the spring the nests should be torn out and the caterpillars killed. Rags saturated with kerosene on the end of a pole may be used to destroy caterpillars in their nests in the higher parts of the trees.

Apple aphids—Plant-lice, or aphids, often become abundant on the apple trees during spring and summer. They are best treated as the buds are breaking but if the insects continue abundant when the first scab treatment is due, 40 per cent nicotine sulphate at the rate of three-fourths pint to 100 gallons of spray should be added to the dilute lime-sulphur solution. It may be advisable to use the nicotine in the first codling-moth treatment also, if the aphids continue destructive, though it will serve merely to check them. The green aphid is sometimes so abundant during summer, especially on young trees, as to warrant treatment, but satisfactory control is difficult on account of the curled condition of the leaves.

Roundheaded apple-tree borer—The round-headed apple-tree borer infests the apple, quince, pear, and numerous wild plants, especially the service-berry, mountain ash, and crab. Trees are attacked at or near the base,

the larvæ feeding the first season under the bark and during the second and third years entering the wood. A few borers in a young tree may kill it, and older trees are always greatly injured by them. Fruit trees subject to attack should be wormed each year, care being taken not to injure the bark and wood more than necessary. The beetles are laying eggs during May and June and less actively until September. They may be largely deterred from egg laying by coating the trunk of the trees, from 3 to 4 inches below the ground to about 1 foot above, with paint. It will often be practicable to remove from the neighborhood of orchards wild host plants, such as service-berry trees and the mountain ash.

Woolly apple aphid—The woolly apple aphid occurs on the limbs and twigs of apple as bluish-white colonies, or patches, but is more injurious to the roots, which become knotty and deformed, thereby stunting the trees and at times resulting in their death, especially during periods of drought. Trees found to be suffering from the woolly aphid at the roots should be given especial care as to fertilization and cultivation, to enable them to grow in spite of the presence of the insect. Lack of growth due to unfavorable soil conditions is often attributed to this insect. Colonies of aphids on limbs and branches may be controlled with contact sprays, such as petroleum oils.

APPLE SPRAYING SCHEDULE.

DORMANT TREE SPRAYING.

During the dormant period of trees sprays may be used much stronger than at other times and for this reason dormant tree spraying is especially advisable for the treatment of scale insects, the blister mite, etc. Applications may be made after the leaves have fallen in the fall, during warm days in the winter, or in the spring before the new growth begins to appear. Where aphids are troublesome it is often practicable to delay the San Jose scale treatment until just as the buds are breaking, and, by adding nicotine to the strong lime-sulphur solution, effect a combination treatment for both the scale and aphids.

SUMMER SPRAYING.

First application—Use concentrated lime-sulphur solution (33° Baumé) at the rate of 1½ gallons to 50 gallons of water plus 2 pounds of arsenate of lead paste (or 1 pound of powdered arsenate of lead) just before the blossoms open. This is for apple scab, the plum curculio, cankerworms, the bud moth, case-bearers, and the tent caterpillar. Add about one-half pint of 40 per cent nicotine sulphate if apple red bugs are troublesome and if apple aphids are much in evidence.

Second application—Use same spray as in first application as soon as the blossoms have fallen. This is for the above mentioned troubles as well as for the codling moth and leaf-spot. It is the most important application for both apple scab and the codling moth. In spraying for the codling moth at this time the aim is to drive into the calyx end of each little apple a quantity of the poison, and, to accomplish this, painstaking work is necessary. Failure to do thorough spraying at this time for the codling moth can not be remedied by subsequent applications.

Third application—Use the same spray indicated above, three to four weeks after the blossoms have fallen. This is the second treatment for the codling moth and leaf-spot, and gives further protection against apple scab and certain insects. In orchards in which blotch has been prevalent this application should be made not less than three weeks after the blossoms have fallen. Where this disease has been severe, Bordeaux mixture (4-4-50) should be substituted for the lime-sulphur solution.

Fourth application—Use Bordeaux mixture (4-4-50) and an arsenical eight to nine weeks after the petals have fallen. This is the first application for the second brood of the codling moth and for bitter-rot. In orchards in which bitter-rot has been a serious disease this application should be advanced about one week.

Fifth application—Use Bordeaux mixture from two to three weeks after the fourth application. This is the second application for bitter-rot, and since it is very little extra expense to add an arsenical, this may be profitably done as a further protection against late-appearing larvæ of the codling moth.

Sixth application—Use Bordeaux mixture again two or three weeks after the fifth treatment has been applied. This is the third application for bitter-rot and is ordinarily sufficient to carry the fruit through, but on specially susceptible varieties in bitter-rot sections a treatment to be made two weeks later may be found necessary.



Small hand pump type of sprayer.

Seventh application—In severe cases of bitter-rot a seventh application may be necessary, and in severe cases of blotch an extra treatment midway between the third and fourth applications is sometimes required.

Note—In the more northern apple-growing sections the first four applications, during ordinary seasons, will be sufficient to protect the fruit from various insects and diseases mentioned. In the more central states, where bitter-rot and blotch are prevalent, the fifth and sixth applications will be necessary. In the case of summer apples only the first three applications are needed.

PEAR INSECTS.

CONTROLLED BY WINTER OR DORMANT TREE SPRAYING.

San Jose scale—The San Jose scale infests pears (except Kieffer and LeConte varieties), and should be treated as described for the San Jose scale on apple.

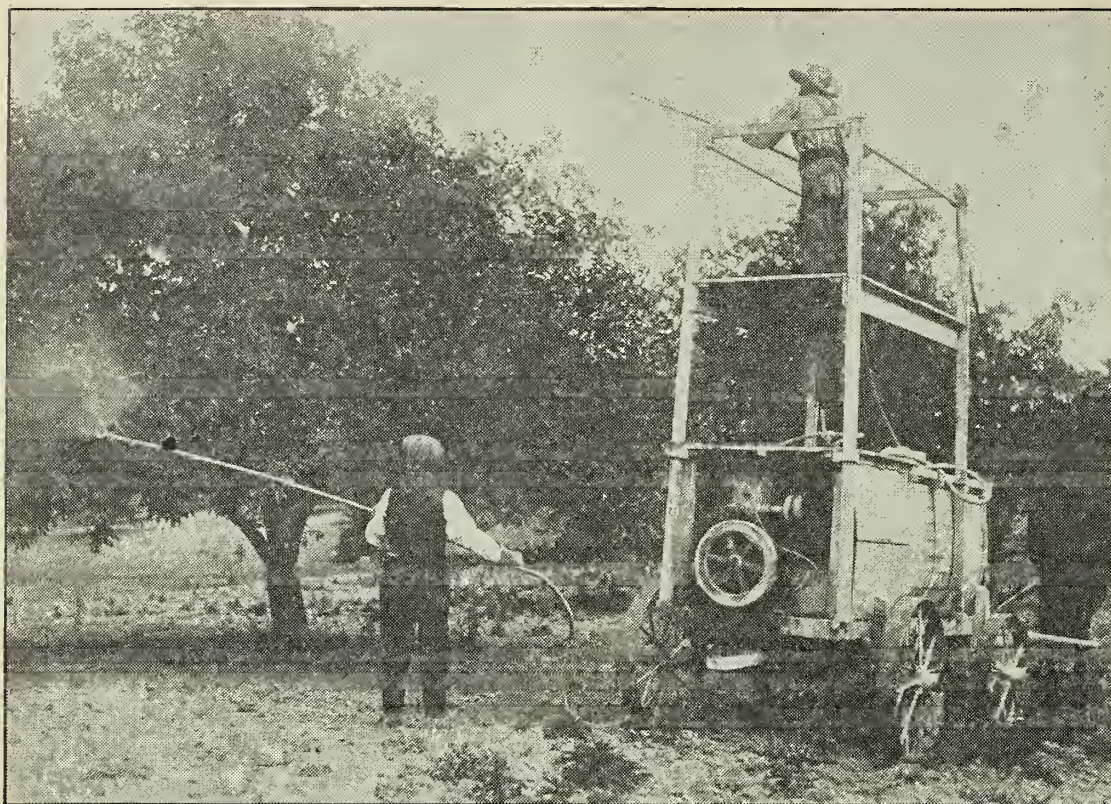
Pear-leaf blister mite—The leaf blister mite is usually present wherever pears are grown and frequently requires treatment on pears as well as on apples. The mites winter behind the bud scales and attack the unfolding leaves and young fruit in the spring, causing reddish or greenish blisterlike spots which, later in the season, become brown and dead. If the attack is severe, the foliage may fall, stunting the fruit and in extreme cases causing it to shed. The lime-sulphur and oil sprays used for the San Jose scale keep the blister mite in check.

CONTROLLED BY SUMMER SPRAYING AND OTHER MEASURES.

Codling moth—The apple worm also attacks the pear, in some localities quite seriously. It should be treated as recommended for the apple; the second, third, and fourth applications of the apple spraying schedule being sufficient.

Pear slug—The pear slug skeletonizes the leaves of the pear, cherry, and to some extent the plum. The slimy snail-like larvæ appear on the trees in May or June, according to latitude. A second brood may be in evidence about midsummer. The pest is easily controlled by arsenicals sprayed or dusted on the foliage, or by the use of contact sprays.

Pear-tree psylla—The pear-tree psylla is very troublesome in some regions and careful and persistent work is required to keep it under control. The insects suck out the sap from the foliage and leaf stalks, causing the leaves to turn yellow, and later brown, and many of these fall prematurely, with consequent injury to the fruit. Infested trees are usually sooty in appearance, resulting from the growth of a black fungus on the sticky excrement or honeydew voided by the insects. Adults hibernate in cracks in the bark of the trunk and limbs, under bark scales, or under trash on the



Power sprayer arranged to reach both the upper and lower parts of the tree.

ground. Special attention should be given to the destruction of the hibernating insects by scraping off the rough bark of the trunk and limbs, and spraying the trees thoroughly before the adults go into hibernation in the fall, or before they emerge from hibernation in the spring. Days should be selected when the sprays will not freeze on the trees. An effective winter-spray is made up as follows: Forty per cent nicotine sulphate, three-fourths of a pint; fish-oil soap, 3 to 5 pounds; water, 100 gallons. Psylla eggs about to hatch, and young nymphs, may be successfully treated in early spring as the blossoms in the cluster buds are spreading, using winter-strength lime-sulphur solution. It usually will be practicable to defer the application for the San Jose scale until this time. Nymphs of the first brood mostly congregate in the axils of the young leaves and fruit, and may again be treated with the nicotine-soap spray, above mentioned, applied just after the blossoms have fallen, arsenate of lead being added for the codling moth.

Pear thrips—The adult pear thrips come from the ground in the spring as the bud scales are spreading, and owing to their minute size are able to work their way within, where they feed upon the tender tissues of leaf and flower buds. Fruits like the pear and prune, which bear the blossoms in clusters, suffer worst, and when the insects are abundant the crop literally may be destroyed in the bud. Fruit blossoms attacked, but which escaped destruction, is likely to be deformed and scabby and of lessened market value. The pear thrips has caused large losses on the Pacific coast, and more recently has become established in the Hudson valley, in Maryland, and elsewhere in the east. It is controlled by spraying with nicotine and soap, or nicotine-distillate spray when the buds first begin to open, and again after falling of blossoms. A second "bud application" is desirable when the insects are very abundant. Best results follow the use of a coarse spray under high pressure and directed from above into the opening buds.

PEACH INSECTS.

CONTROLLED BY WINTER OR DORMANT TREE SPRAYING.

San Jose scale—The San Jose scale requires treatment on peach, and the winter strength lime-sulphur solution should be used on stone fruits in preference to oil sprays.

Terrapin scale—In some regions the terrapin scale is very troublesome on the peach and plum. The honeydew or excrement voided by the scales furnishes a medium for the growth of a black mold which covers the foliage and fruit, lessening the market value of the latter. Lime-sulphur sprays are not effective against this pest, and a miscible oil should be applied in the spring just as the buds begin to swell.

Peach twig-borer—The peach twig-borer tunnels into the tender shoots of the peach in the spring and later attacks the fruit. Fruit in-

jury is especially common in California and other western states. The insect winters as a very small larva in burrows in the bark, in the crotches of the limbs, where it may be destroyed by spraying the trees during the dormant period with winter-strength kerosene emulsion. Lime-sulphur solution, as used for the San Jose scale, is effective if applied as the buds begin to swell in the spring.

CONTROLLED BY SUMMER SPRAYING AND OTHER MEASURES.

Plum curculio—The little snout-beetle known as the plum curculio punctures the fruit for egg-laying and feeding purposes, causing it to fall or become knotty or distorted. It is best controlled by the use of arsenate of lead. Peach growers should follow the peach spraying schedule given later, thus controlling also the peach scab and brown-rot. These three troubles are much the most important ones of the fruit and may be largely prevented.

Peach borer—The peach borer attacks the tree at or below the ground, eating out patches or burrows in the inner bark, and its presence is usually indicated by the exudation from the crown of a mass of gum more or less mixed with dirt and grass. It is a most serious enemy of the peach and to a less extent of other stone fruits, and in most regions must be controlled to prevent destruction of the trees. There is no known method of control more satisfactory than carefully worming the trees in the spring and fall of each year. A related species occurs on the Pacific coast, for which the same control measures are recommended.

Lesser peach borer—The lesser peach borer affects principally the trunk and branches of the peach, plum, and cherry. It follows injury to the bark, as from the effects of freezing, barking during cultivation, etc. Its attacks are best prevented by avoiding mechanical injury to the trunks and limbs. Injured bark should be cut out and the exposed parts of the tree thoroughly coated with suitable paint. Thorough worming is desirable in fall and spring while worming for the peach borer.

Fruit-tree barkbeetle—The fruit-tree barkbeetle, also called the shot-hole borer, attacks most fruit trees as well as related wild plants. Small holes are eaten in the bark, and in stone fruits its injury is usually indicated by the exudation of gum, often copiously. The beetles prefer sickly or diseased trees, or those in a weakened condition from any cause. Such trees when once attacked may be quickly destroyed, and the beetles, on account of their abundance, are thus often thought to be the real cause of the trouble. Injury is best avoided by maintaining trees in a vigorous growing condition, by cultivation, fertilization, pruning, etc. Trees recently attacked may often be saved by severe pruning and fertilization with a nitrogenous fertilizer. Thorough coating of the trunk or branches with heavy whitewash is desirable, as this interferes with the activities of the beetles.

PEACH SPRAYING SCHEDULE.

DORMANT TREE SPRAYING.

Use lime-sulphur concentrate at the rate of about 7 gallons for each 50 gallons of water. This is for the San Jose scale, and if applied just before the buds are due to swell in the spring it will also control peach leaf-curl and the peach twig-borer.

SUMMER SPRAYING.

In the eastern half of the United States most of the peach orchards should be given the combined treatment of arsenate of lead and self-boiled lime-sulphur mixture for curculio, scab, and brown-rot. The latter disease is more especially troublesome in the south, whereas peach scab is worst in the Allegheny mountain region and in the northern states. Peach spraying is now largely practiced by commercial orchardists with excellent results.

Midseason varieties—The midseason varieties of peaches, such as Reeves, Belle, Early Crawford, and Elberta, should be sprayed as follows:

(1). With 2 pounds of arsenate of lead paste (or 1 pound of arsenate of lead powder) per 50 gallons of water, to which has been added the milk of lime made from slaking 3 or 4 pounds of stone lime, about 10 days after the petals have fallen, or at the time the calyxes are shedding.

(2). With self-boiled lime-sulphur mixture and arsenate of lead, two weeks later, or four to five weeks after the petals have been shed.

(3). With self-boiled lime-sulphur mixture (omitting the arsenical) four or five weeks before the fruit is due to ripen.

Late varieties—The Salway, Heath, Bilyeu, and other varieties with a similar ripening period should receive the same treatment prescribed above, with an additional application of self-boiled lime-sulphur mixture alone, to be applied three or four weeks after the second application.

Early varieties—The Greensboro, Carman, Hiley, Mountain Rose, etc., and varieties of the same ripening period should receive the first and second applications only, as prescribed for mid-season varieties.

PLUM AND CHERRY SPRAYING.

Japanese plums should receive the same treatment as peaches having the same ripening season. Soap should be added in the third application to enable the spray to stick to the smooth plum fruits.

Plums other than the Japanese varieties should receive the treatment outlined in the peach-spraying schedule, except that lime-sulphur solution diluted at the rate of 1 gallon to 40 gallons of water is to be preferred to the self-boiled lime-sulphur mixture.

Cherries should receive the same treatment as early varieties of peaches, except that lime-sulphur diluted at the rate of 1 gallon to 40 gallons of water should be used in place of the self-boiled lime-sulphur mixture. Where leaf-spot has been severe this solution should also be used in the first treatment. For the control of leaf-spot an application of the diluted lime-sulphur solution should also be made as soon as the fruit has been picked.

CHERRY INSECTS.

CONTROLLED BY WINTER OR DORMANT TREE SPRAYING.

Cherry scale—The cherry scale resembles closely the San Jose scale and sometimes requires treatment on cherry. Lime-sulphur solution is used as for the San Jose scale. See peach spraying schedule.

Cherry aphid—The cherry aphid is a black, shiny aphid which curls the tender foliage of the cherry in the spring and summer, often severely checking the growth of the trees. It winters on the trees in the egg state, and the young aphids upon hatching congregate on the opening buds. Thorough spraying as the buds are breaking with a nicotine-soap spray or with nicotine in winter strength lime-sulphur spray as for apple aphids will be effective. Summer spraying is of comparatively little value, the insects being protected from the spray by the curled-up leaves.

CONTROLLED BY SUMMER SPRAYING AND OTHER MEASURES.

Plum curculio—The plum curculio seriously injures the cherry and with brown-rot is controlled by the schedule of spray applications given for the peach. The first and second treatments only are necessary.

Cherry fruit flies—In some parts of the northern United States cherries are often more or less infested by the maggots of two species of fruit flies. There is often little external evidence of infestation, though well ripened cherries may become more or less shrunken. Wormy cherries thus are often gathered for

Continued on page 40.

Development of the Cranberry Industry in Oregon

By Wm. E. Schimpff, Secretary of the Oregon Cranberry Growers' Association

THE English language is recognized as the most complete language in use. It is especially rich in words to convey various shades of meaning. In spite of this wealth of words, as applied to the cranberry industry the language is singularly incomplete. It does not contain a single distinctive word that can be used to designate a modern improved cranberry planting. The term bog is used by some to so designate a cultivated cranberry planting, others speak of the same thing as a marsh. Neither of these words does the planting justice, for from these words in their common acceptance we would infer, did we not know better, that either a swamp, or a quagmire, or some other kind of a wilderness was referred to. Such however is not at all the case, as a modern cranberry bog is more like the well kept lawn in a beautiful park. It is the direct opposite of a quagmire.

Were we to look for the reason, we would find that cranberry growing as a commercial proposition is comparatively new, and was started a long time after the promiscuous coining of words for the language was in vogue. Inasmuch as the industry had its beginnings in the United States, an English speaking country, it was not possible to borrow the proper word from a foreign language, because none existed, there being no cranberry industry in any country other than our own.

Then again, the history of agriculture and horticulture of the world is connected solely with alkaline soils. The cranberry being the first cultivated product of an acid soil to make its bow to the world commercially. Hence there was no opportunity for the cranberry industry to borrow any terms from allied industries. It is the pioneer of all horticultural efforts with acid soils. It is unique among the agricultural pursuits of man.

The cranberry is distinctively an American fruit. While varieties of cranberries are found both in Europe and Asia, these are of the small species, and are not readily adaptable to commercial uses. These berries are always popular in the particular district in which they grow. The fruit is gathered from the wild marshes by the people who live in the vicinity of them, but there is no real commercial activity in the wild cranberries of these countries. Here in this country alone is found the large species, which today has become a most important commercial product. No patriotic American family would consider a Thanksgiving or a Christmas dinner complete without having cranberries served on that festal occasion.

The Pilgrim fathers recognized the merits of the cranberry and made use of them immediately upon their reaching this country. It was from the Massachusetts Indians that the Pilgrims learned the art of making sugar from the sap

of the native maple, and with this as a sweetener cranberries promptly found a place on the table of these hardy pioneers. The Pilgrims found their Thanksgiving dinner in the country in which they had selected as their home, for not only did cranberries abound there, but wild turkeys as well. This ideal combination has persisted to this day, and it is doubtful whether a combination can be found that is so fittingly appropriate and so typically American as well.

From the limited use to which cranberries were put by the residents of the Massachusetts colony, an industry in a small way sprang up. Shipments of cranberries were made to nearby cities and were readily consumed. It was not until the beginning of the last century that the industry began its real march of progress. Massachusetts was the pioneer state. Other states of the union took up the challenge, and the cranberry was taken seriously. Today Cape Cod is the ranking cranberry growing district of the United States, New Jersey comes next, following New Jersey comes Wisconsin, and now comes the Pacific Coast modestly claiming fourth place.

Contrary to the general belief, the cranberry industry is not any new undertaking here. Some thirty-five years ago H. D. McFarlin, a Cape Cod cranberry grower, and the originator of the variety which bears his name, came to the Pacific Coast and located in Coos County, where he set out a five-acre tract of cranberries, and from the crops raised on this tract he made his living. McFarlin lived to a ripe old age. His marsh is still one of the best producing cranberry bogs on the Coast. About this time A. Chabot undertook the setting out of a tract of about fifty acres in Pacific County, Washington. This location is just north of the Columbia River at its mouth. Unfortunately Chabot died before the tract was completely set out,

and while today the marsh still bears fruit, it is in a poor condition as compared with the well kept McFarlin bog at Coos Bay.

Cranberry culture was next undertaken in a small way on the Ilwaco Peninsula, and almost invariably the efforts of the growers met with wonderful success. Crops of 100 barrels to the acre were common. The wonderful climate of this section seemed to particularly favor the harvesting of bumper crops year after year. The greatest factor in this regularity of big crops being without question immunity from frost during the growing and harvesting season. The first large undertaking in this district was the setting out of eighty acres at Seaview, Washington, in 1910. This is still the largest tract of improved cranberry land on the Pacific Coast. About this same time H. M. Williams was attracted to the Pacific Coast by reason of the wonderful yields made in this section. Williams being an old time Cape Cod cranberry grower at once selected the mouth of the Columbia as his field for operation. His experience in the industry convinced him of the wonderful possibilities of the industry in this section.

Williams undertook the setting out of a tract of some two hundred acres, and while this tract was coming into bearing, he made a very careful and thorough study of cranberry by-products. Today in addition to owning one of the finest cranberry bogs on the coast, Williams is also engaged in the manufacture of cranberry juice, cranberry syrup, cranberry jam, and other similar products at his plant, the Cranmoor Manufacturing Company in Portland. The fame of Cranmoor products has already been well established.

For a long time after this development had begun in her sister state of Washington, Oregon, with characteristic deliberateness, made no effort at the development of its similar land in Clat-



Cranberry bog at Allendale, Oregon, being put in condition for planting. This view shows how the turf is scalped down to the peat, which is then sanded.



An illustration showing in the foreground a newly planted cranberry bog.

sop County. The climatic conditions were identical, and in addition to the natural advantages of the district immediately to its north, the Cullaby Lake district in Clatsop County was favored with a bountiful water supply, as well as having the further advantage of splendid rail transportation. At length the Oregon spirit became aroused, and cranberry planting began in Clatsop County in real earnest. To C. N. Bennett, a civil engineer, properly belongs the credit of being its chief sponsor. Bennett had been engaged in making a complete survey of the industrial, agricultural and horticultural possibilities of Clatsop County and his trained mind immediately recognized the latent possibilities of a cranberry industry in Oregon. Associating himself with some of the business men in Astoria, cranberry development was begun in the Cullaby Lake district of Clatsop County.

The wild marsh selected by Bennett was the tract lying directly east of the right of way of the main line of the S. P. & S. Ry., and bounded on the east side by the waters of Cullaby Lake, Cullaby Creek and Cullaby Canal. The tract is just one mile from the Pacific Ocean and lies but eleven miles from Astoria by railroad. No cranberries had ever been commercially grown in this district. Wild cranberries abounded in this region. They were of excellent flavor and grew profusely. These wild cranberries were much esteemed by the natives. Lewis and Clark in their Memoirs mention cranberries as one of the articles of food which they traded for with the Indians of this section. The site of their camp when they wintered here in 1805-06 is but a short distance from one of the bogs of Clatsop County. The dinner bell calling the pickers from their labors on this bog, can be heard at the site of the winter camp of these intrepid explorers.

A few years previous to Bennett's discovery of this section as a cranberry district, a drainage canal had been dug connecting the waters of Cullaby Lake with Skipanon Creek, a tributary of the Columbia River. The purpose of this canal being to bring logs from the Cullaby Lake district to the mills of the

Columbia River. The drainage of the lands of the district was incidental. To a prospective cranberry grower, the district was at once made available for development. The presence of Cullaby Lake makes the district especially attractive from the viewpoint of cranberry development. Today the lake level is about eight feet lower than the level of the marsh, thus providing sufficient drainage at all times when needed. Cullaby Lake is a body of fresh water about two miles in length and varying in width from one-fourth to one-half mile.

It is the intention of the growers to use the waters of this lake by pumping the same directly on their lands. After the land has been flooded, the water will run back into the lake through the ditches which are used in flooding the marsh. The water is thereby conserved and can be used over and over again. It is questionable whether there is such a favorable location for a cranberry marsh anywhere else in the United States.

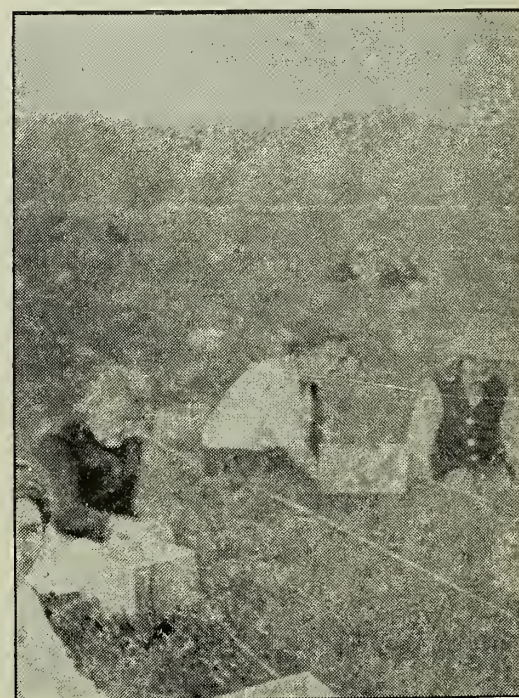
The first planting of cranberries in the Cullaby Lake district of Clatsop County, was made in May, 1911. That year a total of three acres were set out to vines. Today there is a total of 129 acres in vines in this locality. The setting out of an acre of cranberries is a much more complicated matter than the setting out of an acre of fruit trees. It is first necessary to drain the wild marsh. This in Clatsop County is quite inexpensive as ditches need only be cut to Cullaby Lake. Next the marsh must be cleared of all trees and brush, then the turf must be scalped and removed, leaving only the bare peat, which is covered with a coating of sand to a depth of about three or four inches. Planting is the next proceeding, and for this purpose vine cuttings are used which are pressed into the peat through the sand with a planting tool or dibble. The usual distance between hills being ten inches in this section. This makes over sixty thousand hills to the acre. The cost of this improvement varies. Including the land it should cost in Clatsop County about \$1000 per acre.

Since the conclusion of the war a larger development has been undertaken in spite of the increased cost of labor. The noteworthy point in connection with this great development is that it is being undertaken almost exclusively by those who already have large holdings in the industry.

Fortunately all of those who are engaged in the industry in the Cullaby Lake region reside at the bogs or at best a few miles away at Astoria. This insures the bogs receiving the very best attention. Cranberry culture is a strictly horticultural venture and requires close application. During the period when the vines are coming into bearing, the bogs must be kept free from weeds, so that the plant can make its best growth. The cranberry vine has so far only been improved by selection, and therefore retains all of the vigor it had in its wild state, but naturally thrives best when carefully nurtured and kept free from weeds.

The first real commercial pack of cranberries from this district was harvested in 1918. In that year the total yield was over 3000 barrels. At that time, counting every acre set out to vines there was an even 100 acres in Clatsop County. This included many acres too young to bear any fruit. Yet taking them all into consideration the average in consequence of this computation was in excess of 30 barrels to the acre. This exceeds or at least equals the average yield for Cape Cod, where the average yield is placed at 30 barrels to the acre. Records of 100 barrels to the acre on the Pacific Coast are common and have run as high as 250 barrels to the acre.

Several different varieties of fruit have been planted by Oregon growers. All of these varieties having originally been imported from eastern bogs. The native berries being universally of the smaller, uncommercial species. During the early days of this country, these small berries were picked by the residents of the district and shipped to various coast markets. The industry was



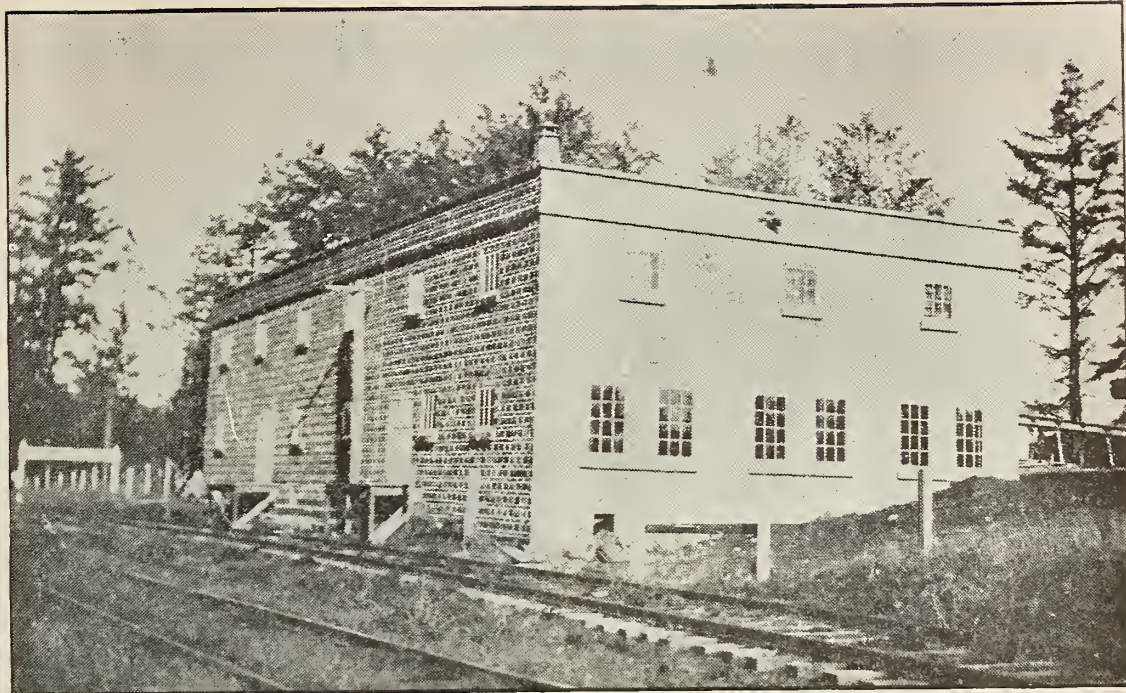
How the cranberries are picked.

in no wise an important one. With the development of the cranberry industry in eastern states, and the improvement of the pack of those sections, the demand for the native berries fell off rapidly and the industry died before it really had much of a beginning.

Today the growers of Clatsop County are organized into a live association, which they designate the Oregon Cranberry Growers' Association. This association has greatly helped in standardizing the pack of its members. It markets its fruit through the medium of the Pacific Cranberry Exchange, an organization which also handles the Washington product. Nearly every berry grown on the coast finds its way to the market through this agency. It is a 100 per cent growers' affair. Henry S. Gane, a Long Beach, Washington, grower, is the sales manager for the exchange, and has handled its business in a very successful manner. The returns to the grower have been very satisfactory during the entire period of the organization of the exchange.

The Pacific Coast growers have paid particular attention to the selection of such varieties as will be of good marketable size and excellent keeping quality. One of the varieties which has been imported originally from eastern sources has done so well that it has been appropriated by the growers of Oregon and is now known as the Oregon Jumbo. This berry is of large size and is in great demand by the trade. It is a splendid keeper. Some of the fruit of this variety being placed on the markets of Portland just preceeding last Easter. With this variety the growers feel satisfied that they can meet the demands of the most particular trade.

Unlike other small fruit cranberries are not generally placed on the market immediately after harvesting, but are stored in warehouses until such times as they are needed in the markets. Just before being put on the markets they are run through a mill which takes out



Warehouse of the Oregon Cranberry Growers' Association at Allendale, Oregon, located along the main line railroad. At the extreme right can be seen the railroad that runs from the second floor of the warehouse to the bogs.

the chaff, and removes the small and soft berries. It is the usual practice to run the fruit over sorting tables in addition to the milling process, in order to remove such imperfect fruit as may have escaped the mill. At Allendale, where one of the largest cranberry projects is located, and a modern warehouse built, hand sorting was not resorted to this year. The work of the mill being satisfactory. The berries being marketed early in the season, there was but little shrinkage and the extra cost of hand sorting was saved to the growers. In the preceding season, 1918, the last run of berries was made on December 17th. During the afternoon of this day two women hand sorters packed 90 boxes of one-third barrel each. The cost of this sorting being

but 2¼c per box. A most gratifying record. The advantage of a good keeping variety to the grower can readily be seen. It not only saves him from running up excessive packing house costs, but the saving in fruit alone is in itself a very considerable item. The fruit which is graded out by the machine or by the hand pickers costs just as much to harvest as that which goes in the boxes to the trade.

While there is a salvage obtainable from soft fruit, which can be used for juice making, still it is much more satisfactory to the grower to have the fruit hold out sound until actually ready to be put on the market. A further advantage in having fruit of this variety is in the fact that the fruit is uniformly large, and the percentage of undersized, or so-called pie berries is negligible.

Combined Bordeaux Oil Emulsion Spray

By Dr. C. A. Macrum

THIS emulsion spray was evolved by Dr. C. A. Macrum, commissioner for the Fourth District of the Oregon State Board of Horticulture.

If applied as the buds are opening, before the blossoms appear, will control scab, San Jose scale, aphids, leaf roller, red spider, curl leaf of the peach and the copper will be present to prevent the ravage of anthracnose spore when the rains come in the fall of the year, and control the disease in prunes due to the cylindrosporium.

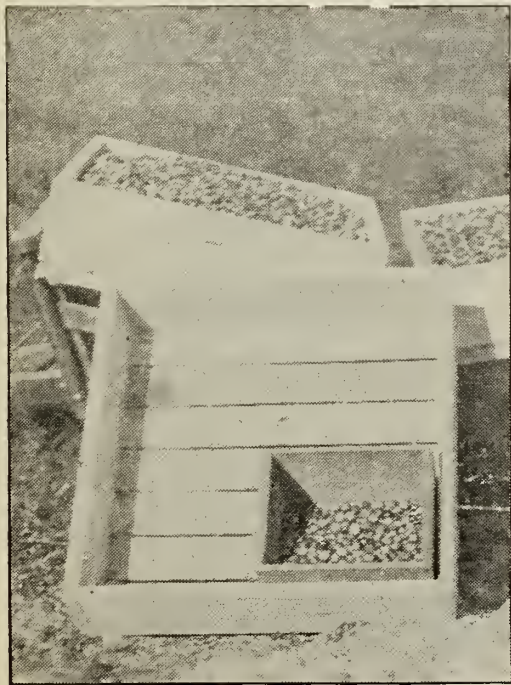
The method of preparation is as follows: Prepare the copper sulphate solution in the usual proportions of one pound to the gallon of water, dissolve one and one-half pounds of common glue in one and one-half gallons of water, slack twelve pounds of lime, or stir twelve pounds of hydrated lime in water at time of using. Fill a 200 gallon spray tank three-fourths full of water. Pour twenty-four gallons of bluestone solution into the tank, start the agitator

and add the lime milk slowly until a neutral solution is had. Test with litmus paper to tell when the solution is neutral. Add the one and one-half gallons of glue solution. Measure out twelve gallons of the General Chemical Company's No. 1 oil emulsion, or a corresponding oil emulsion, add a little water and stir until emulsion is started as shown by the mixture turning milky. Pour into the spray tank and add water to make 200 gallons. The agitator must be kept running during the whole procedure. The spray should be applied as soon as prepared.

The above are the proportions for a 200 gallon tank. In making stock solutions for a day's spraying the quantities given can be multiplied by the number of tanks required.

The strength of the Bordeaux can be varied as deemed necessary. The amount of copper sulphate in the above formula is the same as the ordinary

Continued on page 39.



Cranberries in the field ready to be taken to the warehouse. The large box shows the style of crate used for storage and the small one the picking box.

Practical Methods in the Use of Orchard Heaters

By George Calvert

ORCHARD heating, like spraying or any other of the special departments involved in fruit raising, must be conducted on absolute rules prescribed by the work if the grower hopes to obtain a high degree of success. In spraying there are many men who condemn the practice, but this condemnation comes from the man who has made a failure of it and not from that large class of up-to-date hardworking body of fruit growers who by following scientific methods are today realizing handsome returns from their orchards.

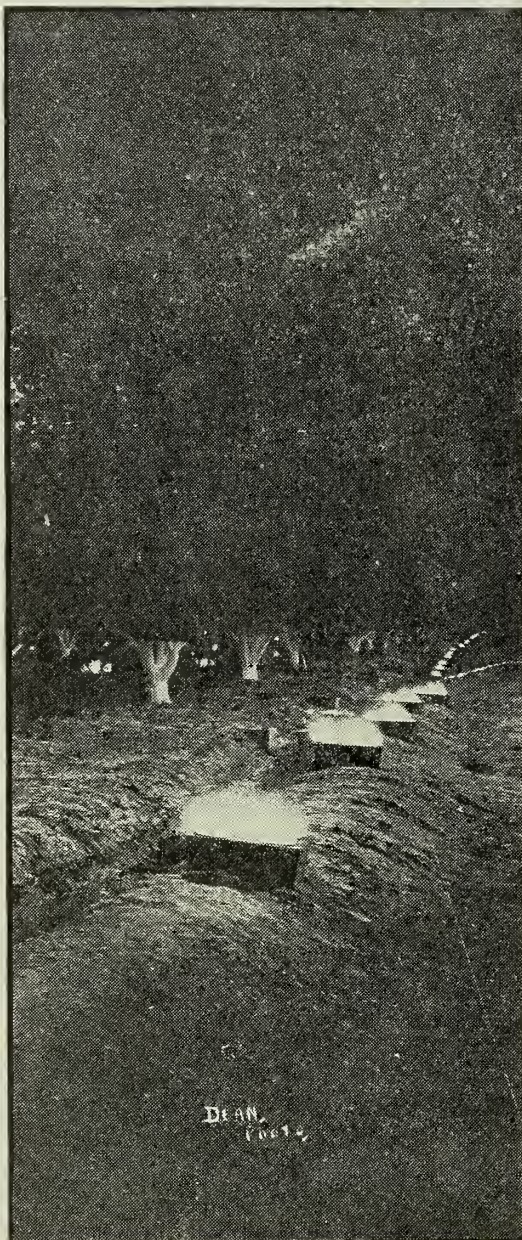
There are many growers who do not believe in orchard heating, but these are the very same men who never believe in anything which is an innovation in past history and methods. It is right here that I desire to point out an analogous case of business judgment which compares favorably with the orchard heating subject. Where, for instance, can the intelligent man be found who will refuse to protect a twenty thousand dollar building against fire through the agency of an insurance policy due to the cost of the annual premium. Yet, there are thousands of fruit growers with ten to twenty acres of modern orchard capable of producing an annual crop valued at a gross of from \$500 to \$1200 per acre who refuse to safeguard the same against the ravages of frost. Suppose that the frost cuts the crop down to 25 per cent of its normal production, or in other words a frost loss of 75 per cent. If the normal crop was valued at \$500 per acre, the loss in dollars and cents is \$325 per acre, leaving a gross return from the orchard of only \$125. Just think in figures for a minute in order to argue this subject with yourself. Say the orchard heating work costs \$25 per acre, (which is almost the maximum) and a normal crop was secured through orchard heating. Is not the frost insurance premium a mighty small item of cost?

In this discussion of the rules to be followed for practical orchard heating work the writer does not aim to challenge a dispute with so-called scientists who have experimented with orchard heaters in a laboratory, and who could not make a living in a real orchard if someone else put up the money and did the heavy work. Scientific knowledge coupled with practical work are the components which has made and is making the fruit industry of today and the future.

The sole aim of this story is to outline a series of practical suggestions on orchard heating which may be used to advantage by the practical grower—the grower who is in the fruit raising business for the profits which it affords.

First comes the question of fuel for operating orchard heaters, which comprises crude oil and coal. The former is more convenient in every way though in certain localities the price of oil is high due to the distance from the source of supply, and the price of coal is low.

In this case coal heaters are to be considered. When it comes to a question of selecting an orchard heating equipment this is an important subject for the success of orchard heating depends upon the ability of the heaters to do the work desired. First of all the heaters must be able to make sufficient heat to offset the frost forming temperature within the orchard area. The heat pro-



Orchard heaters in operation.

ducing capacities of the heaters must therefore be able to cope with varying degrees of temperature which visit each fruit district at a time when the crop native to the locality is at the critical period of growth. Almost all fruit belts of the United States are subject to a frost and a low temperature reaching 15 degrees above zero, and it is this cold temperature which the fruit grower has to combat, although in most fruit belts the extreme low temperature mentioned above is rarely reached at times when frost is a factor. One may have ideas to the contrary but it is a fact nevertheless. As an illustration the conditions existing on the extreme Southern Peninsula of Florida may be pointed out to advantage. This semi-tropical latitude

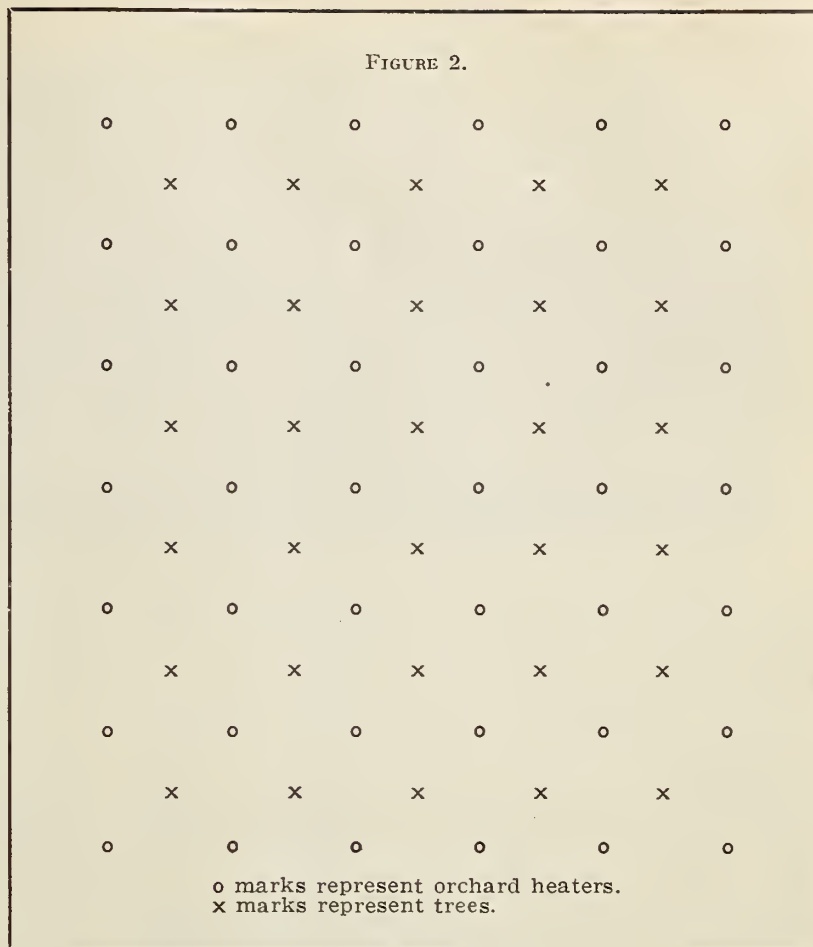
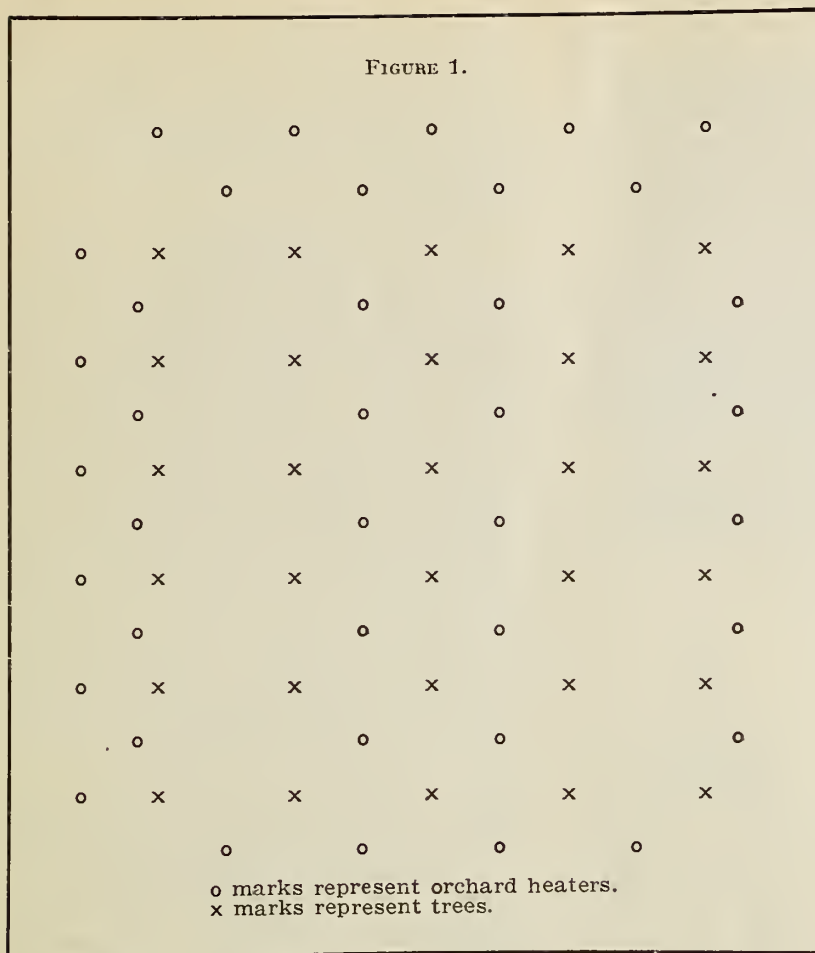
is subject to frost from December 20 to March 20, although of course that section does not have injurious frosts every succeeding year, yet the danger is there all the same and the growers cannot afford to take a chance with their valuable produce without the protection of orchard heaters. There are many fruit belts in the far west where growers have been placed in financial straights due to the almost entire loss of crops in succeeding years. So it is well to illustrate the safeguards which orchard heaters afford.

The month of April is usually the mischief maker among growers of all deciduous fruits and the conditions apply in all sections both east and west.

Much confusion has existed among growers in the practical utilization of orchard heaters, so well defined rules will be helpful to obtain the greatest success. An abundance of fuel for refilling the heaters should be provided in order to combat thoroughly every time frost appears, for unless the job is done completely the growers had better save the expense, because the work will produce far greater results than the man who makes no attempt to protect his crop.

The heater should be placed in the orchard at least ten days or two weeks prior to the blossoming, but when frost is impending it is well to arrange two rows on the north and west-ward sides of the orchard as from these directions usually come the accompanying winds which bring the low degrees of temperature. Many growers have had excellent results from arranging the heaters in the form as shown in diagram No. 1. Others prefer to arrange them as illustrated in figure 2. As frost formation moves in streaks over a given surface of land, it has been proved that the arrangements indicated in figure 1 has been equally as successful as the arrangement shown in figure 2. The double row affords an abundance of heat which will drift toward the inner area of the orchard provided wind accompanies the low temperature and the distribution of the heated air in the orchard area is kept in circulation to better advantage and prevents the formation of frost.

There are many different types of oil heaters on the market and a good plan for every practical fruit grower to adopt is, to get a sample of each make and try them out under his own tests. For a few dollars he could secure before purchasing an entire equipment, a sample of all the different styles and by this measure he can soon determine upon the device which meets all the demands of the work. It is well to warn growers not to purchase an equipment of orchard heaters which make an excessive amount of smoke when burning, for a fruit tree is in its most tender condition of growth at the blossoming point and the delicate little blossoms are often injured by an excessive amount of smoke and soot, which not



only reduces the size of the crop but may permanently injure the future health of the trees themselves. A fruit tree at this stage of development cannot stand being smoked like a ham, so it is important that the heaters burn the fuel with a good degree of combustion.

The latest and much approved types of orchard heaters are constructed with dampers. This improvement permits of regulating the amount of heat necessary to combat the temperature upon a particular night and thus works a big economy in the saving of fuel oil as it is both useless and impractical to burn

the heaters at full blast when the temperature has only reached twenty-five degrees. In case the succeeding night the temperature falls to 20 degrees it would be necessary to apply a greater amount of heat and the dampers could be adjusted very quickly to offset the

Continued on page 38.

Results of Pollination Studies at Idaho University

By C. C. Vincent, Horticulturist, University of Idaho, Moscow, Idaho

THE subject which has been assigned for me to discuss, "Orchard Pollination," is one which has received considerable attention at the Idaho Experiment Station for the past ten years. The original problem, Apple Breeding, has had to do with the improvement of orchard fruits and in the investigating of this phase of the work, certain problems have been encountered, which it is hoped will prove of interest and value to all investigators in a similar field as well as to practical orchardists of the Pacific Northwest.

Self-Sterility an Orchard Problem.

One of the first problems in orchard pollination is the discovery of varieties which are inclined to be unfruitful when planted alone. There are several reasons for this failure to produce fruit: too vigorous wood growth; defective stamens, which do not produce normal pollen; location; climatic conditions such as frost injury and rain during the blooming period. Probably the principal cause of self sterility is the inability of the pollen of a variety to fertilize its pistils.

The writer first became interested in pollination studies in 1907, while connected with the Oregon Agricultural



The bagging methods used in making sterility and fertility tests.

College. The results of this work were reported in Bulletin No. 104 of that station. The data showed that out of 87 varieties of apples, 59 varieties were found to be self-sterile; 15 varieties self-fertile; and 13 varieties partially self-fertile.

Various reports seem to indicate that a variety may be self-fertile in one locality and self-sterile in another. W. S. Fletcher in his bulletin entitled "Pollination in Orchards," concludes that "self-sterility is not a constant character with any variety." The same variety may be self-sterile in any place, and nearly self-fertile in another. Darwin writes of a plant that was self-sterile in Brazil, but when grown in England became self-fertile in one or two generations.

That self-sterility is not a constant character is shown by the following examples: The Yellow Newtown is listed as self-sterile in Farmers' Bulletin No. 65, and self-fertile in Oregon Bulletin No. 104. In our experiments at the Idaho Experiment Station we have found this variety to be partially self-fertile. The Rhode Island Greening is listed as self-fertile in Farmers' Bulletin No. 65 and in Bailey's "Principles of Fruit

Growing." Fletcher in his book, "How to Make a Fruit Garden," Oregon Agricultural Experiment Station Bulletin No. 104, and in Idaho this variety is listed as self-sterile. The same variations are also noticed with the Grimes Golden. Fletcher classifies the Grimes as self-sterile, Oregon bulletin as self-fertile, and Idaho reports it as partially self-fertile. This peculiar phenomena existing among different varieties makes it almost necessary to test out commercial varieties in each locality. The results secured are shown in the following table:

TABLE 1.—SELF-STERILE AND SELF-FERTILE VARIETIES—UNIVERSITY OF IDAHO.

Variety	Blossoms bagged			No. fruits set			Total Fruit Set	% Fruit Set
	1911	1912	1914	1911	1912	1914		
Arkansas Beauty	....	....	216	...	...	84	84	38.8
Arkansas Black	448	....	...	0	...	...	0	0
Ben Davis	708	....	...	9	...	...	9	1.2
Bailey's Sweet	515	....	...	0	...	...	0	0
Bismarck	545	....	195	8	...	0	8	1.1
Ben Hur	93	....	...	0	...	...	0	0
Blue Winter Pearmain	1194	....	228	0	...	0	0	0
Cox Orange	1102	....	175	0	...	9	9	3.2
Early Harvest	....	....	152	...	...	2	2	1.3
Elk Horn	178	....	...	0	...	...	0	0
Grimes Golden	683	9717	365	16	227	4	247	2.2
Gano	310	....	358	0	...	24	24	3.6
Gravenstein	230	....	596	16	...	17	34	3.5
Hyde's King	289	....	207	0	...	8	8	1.6
Hitt	189	....	...	10	...	...	10	5.3
Haas	227	....	280	0	...	4	4	.79
Jefferies	238	....	200	0	...	5	5	1.1
Jonathan	388	17376	1317	5	547	14	566	2.9
King David	357	....	248	0	...	3	3	.49
Mann	235	....	...	5	...	...	5	2.1
Mother	317	....	170	2	...	0	2	.41
Maiden's Blush	564	....	...	33	...	...	33	5.8
Minkler	323	....	191	0	...	0	0	0
Missouri Pippin	155	....	250	2	...	4	6	1.4
Montreal Beauty	....	....	239	...	...	17	17	7.1
McIntosh Red	....	....	228	...	...	0	0	0
Northwestern Greening	293	....	306	0	...	0	0	0
Northern Spy	43	....	...	0	...	...	0	0
Oldenburg	....	....	381	...	...	75	75	19.9
Primate	131	....	148	0	...	0	0	0
Palouse	90	....	...	4	...	...	4	4.4
Red June	180	....	...	60	...	...	60	33.3
R. I. Greening	445	....	136	0	...	...	0	0
Rome Beauty	263	9288	535	0	470	0	470	4.6
Spitzenburg	250	....	...	1	...	...	1	.4
Twenty Oz. Pippin	410	....	152	0	...	1	1	.17
Transcendent Crab	573	....	263	0	...	0	0	0
Tetofsky	150	....	192	0	...	0	0	0
Winesap	215	....	150	0	...	0	0	0
Wealthy	135	....	216	3	...	10	13	3.7
Wagener	1309	6115	214	57	953	4	1014	13.2
W. W. Permain	400	....	140	0	...	4	4	.74
Whitney Crab No. 20	535	....	...	2	...	...	2	.37
Winter Banana	354	....	187	0	...	0	0	0
Westfield	140	....	...	1	...	...	1	.71
Yellow Transparent	107	....	...	36	...	...	36	33.6
Yellow Bellflower	372	....	...	0	...	...	0	0
Yellow Newtown	133	....	...	2	...	...	2	1.5

SELF-STERILE AND SELF-FERTILE VARIETIES—1914.—LEWISTON, IDAHO.

Variety	Number blossoms bagged	Number fruits set	Per cent of fruit set
Arkansas Black	63	0	0
Black Twig	27	0	0
Delicious	231	0	0
Jonathan	486	13	2.8
Rome Beauty	240	2	.83
R. I. Greening	45	0	0
Stayman Winesap	225	1	.45
Spitzenburg	379	3	.79
Winter Banana	222	5	2.2
Yellow Newtown	447	20	4.4

The above results would indicate that the majority of the varieties were practically self-sterile. In a number of instances it will be noticed that only one or two fruits would set out of the 300 or 400 blossoms enclosed, and while these have been classed as partially self-fertile, they would from a practical standpoint be considered as self-sterile. Another surprising feature of the work as shown in the table is the fact that certain varieties when confined to their own pollen may set a few fruits one year and none the next. This was found

to be true with such varieties as the Bismarck, Cox Orange, Hydes King, Haas, Jefferies, King David, Mother, Rome Beauty, Twenty-Ounce Pippin and White Winter Permain. Kraus of Oregon, states that "some varieties of apples have been found to be self-sterile three years out of five and self-fertile the other two."

Hendrickson, of California, in his work with the common honey bee as an agent in prune pollination has found that the Imperial prune, though usually self-sterile, in occasional years, at least, is partially self-fertile. The Winter

King, Haas, Jefferies, Jonathan, King David, Mann, Mother, Missouri Pippin, Palouse, Rome Beauty, Spitzenburg, Stayman Winesap, Twenty-Ounce Pippin, Wealthy, White Winter Pearmain, Whitney Crab No. 20, Westfield, Yellow Newtown.

Setting of Fruit Under Natural Conditions

The percentage of fruit that set when the blossoms were confined to their own pollen, as shown in Table I, varies from .17 per cent to 38.8 per cent. What then would constitute a normal set of fruit among varieties of apples when the blossoms are exposed to insect visitation, as it is a well known fact that all the flowers that are produced in the spring will not mature fruit. To determine the percentage of fruit that ordinarily sets under natural conditions, counts were made on certain branches at blooming time and final counts made later in the season. The final counts of the "fruits set," were taken on June 15. The results secured were as follows:

TABLE No. 2.—No. OF FRUITS SET UNDER NATURAL CONDITIONS—1912.—UNIVERSITY OF IDAHO.

Variety	Number blossoms counted	Number fruits set	Per cent of fruit set
Wagener	1140	664	58.2
Grimes	1077	819	76.0
Rome	1092	510	46.7
Jonathan	1106	814	73.5

The average for the four varieties is 63.6 per cent. Unfortunately counts were not made when the fruits were harvested in the fall. If they had been made, it is evident that this average would have been reduced at least 50 per cent. A normal set of fruit among apples then would be approximately 31.8 per cent. Fletcher states that under eastern conditions "Scarcely one fruit blossom in ten sets fruit, even in the most favorable seasons and with the most productive varieties." From personal observations I am under the impression that his estimate would be entirely too low for our dry conditions here in the Northwest.

Banana at Moscow was found to be self-sterile, while at Lewiston, it was partially self-fertile.

Out of the fifty varieties of apples tested for their sterility and fertility, eighteen were found to be self-sterile; seven self-fertile and twenty-five partially self fertile. They have been classified as follows:

Self-sterile Varieties: Arkansas Black, Bailey's Sweet, Blacktwig, Ben Hur, Blue Winter Pearmain, Delicious, Elkhorn, Minkler, McIntosh Red, Northwestern Greening, Northern Spy, Primate, Rhode Island Greening, Transcendent Crab, Tetofsky, Winesap, Winter Banana, Yellow Bellflower.

Self-fertile Varieties: Arkansas Beauty, Hitt, Maiden's Blush, Montreal Beauty, Red June, Wagener, Yellow Transparent.

Partially Self-fertile: Ben Davis, Bismarck, Cox Orange, Early Harvest, Grimes Golden, Gano, Gravenstein, Hyde



General view of the cages in the college orchard at the University of Idaho.

If then, under the most favorable conditions 31.8 per cent constitutes a normal set of fruit when two or more varieties are planted together, we can readily see that the majority of the varieties listed in Table I would not produce a crop if planted in large blocks by themselves.

Methods of Determining Self-Sterility.

Fletcher states that "merely enclosing the unopened blossoms of a variety in paper sacks is not a fair test of the ability of the variety to set fruit with its own pollen." This method, however, is one followed largely by investigators at the present time. If the bagging method is not a conclusive test for self-sterility, what method then should be followed? In 1912, two methods were tested out: First, enclosing unopened blossoms in paper sacks; second, erecting tents of cheese cloth over individual trees. The results secured by the two methods are given in Table III.

TABLE 3.—BEHAVIOR OF DIFFERENT VARIETIES TO SET FRUIT UNDER THE TWO METHODS—1912—UNIVERSITY OF IDAHO.

Blossoms Bagged	Number blossoms bagged	Number fruits set	Per cent of fruit set
Grimes	1485	78	5.2
Jonathan	1788	86	4.8
Rome	2418	72	3.0
Wagener	2456	302	12.3

Blossoms Caged	Number blossoms in cages	Number fruits set	Per cent of fruit set
Grimes	8232	149	1.7
Jonathan	15588	461	2.9
Rome	6870	398	5.7
Wagener	3659	651	17.7

It is evident from the results secured that there is very little difference between the two methods used.

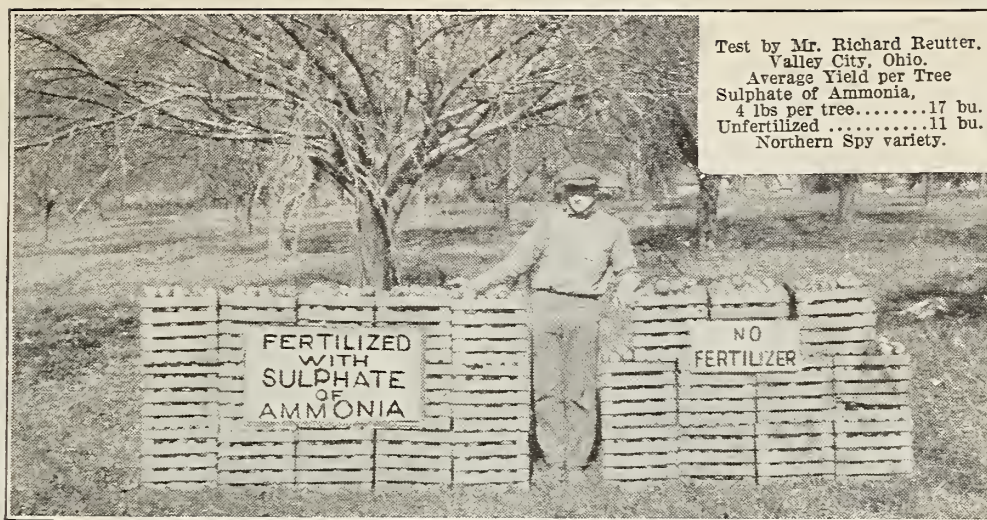
To determine if there was any difference in the temperature within the cages and the temperature on the outside, thermometers were placed in different positions among the branches. The readings show that the differences under the two conditions were very slight.

TABLE 4.—TEMPERATURE WITHIN THE CAGES.

Position of Thermometer	Grimes Golden. Temperature in cage	Temperature in open
Under branches....	21½°c	21°c
Exposed to sun....	22½°c	23°c
Center of tree.....	22°c	19½°c
Side of tree.....	21½°c	20½°c
Upper branches....	24°c	22½°c

Seed Development.

In view of the fact that seed production is supposed to be the exciting cause of the growth of the flesh of the fruit, a study was made of the self-fertilized and cross-fertilized fruits. In Bulletin No. 104 of the Oregon Experiment Station, it was found that the majority of the fertile and partially fertile fruits were seedless fruits or fruits with only a few seeds. Fletcher in his work with pears found that the fruits produced from Bartlett pollen had shrunken seeds and failed to germinate. Our results confirms those already recorded as shown in the following table:



TOP DRESSING TALKS, No. 4

Nitrogen Pays in the Orchard

"Orchards in a somewhat run-down or devitalized condition are greatly benefited by the use of nitrogen.

"Nitrogen added in March causes a larger percentage of set of fruit in April, an immediate change in the character of the foliage, and a stimulation of the wood growth." (From Oregon Agricultural Experiment Station Report 1914-1915.)

This station also reports that in an apple orchard test in Hood Valley, Oregon, "\$30.57 worth of fertilizer for each acre increased the yield from 68 to 756 boxes, approximately 11.1 times in two years."

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Sulphate of Ammonia

Arcadian Sulphate of Ammonia is the best form of nitrogen for orchard fertilization. The following are its advantages:

Arcadian contains $\frac{1}{3}$ more nitrogen than any other top dressing fertilizer.

The nitrogen is all soluble, quickly available and non-leaching.

Its crop-producing power per unit nitrogen is equal to or greater than any other nitrogenous fertilizer.

In addition to its high nitrogen content it is rich in sulphur, an important plant food often lacking in Western soils.

It comes in fine mechanical condition and can be applied by hand or fertilizer distributor without previous grinding or screening.

It is low priced per unit ammonia.

Top dress the orchard with from 100 to 200 lbs. per acre in the zone of the feeding roots, just before blossoming time.

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TABLE 5.—No. OF SEEDS PRODUCED BY VARIETIES IN DIFFERENT CROSSES.

Cross	No. fruits	No. seeds	No. seeds per fruit
Gravenstein x Gravenstein	47	5	.10
Maiden's Blush x Maiden's Blush.....	2	7	3.5
Rome Beauty x Rome Beauty.....	2	6	3.0
Spitzenburg x Spitzenburg.....	3	7	2.3
Winter Banana x Winter Banana.....	4	3	.76
Wagener x Wagener	27	14	.51
Yellow Newtown x Yellow Newtown.....	10	0	0
Spitzenburg x Jonathan.....	12	81	6.7
Jonathan x Wagener.....	34	205	6.0
Wagener x Jonathan.....	131	769	5.8
Jonathan x Spitzenburg.....	14	76	5.4
Jonathan x Ben Davis.....	207	1216	5.4

Apple Cross-Pollination.

From the data presented it is evident that a large number of our commercial varieties of apples are self-sterile and furthermore those that are apparently fertile or partially so, are inferior in size to the fruits that set under natural conditions.

Cross-pollination experiments are therefore necessary in order to arrive at definite conclusions, concerning the best pollinizers for any commercial variety. Naturally then the question arises as to what constitutes a good pollenizer. In the first place there must be a mutual affinity between the varieties planted together. At the present time very little is known about the sexual affinities of our cultivated fruits. To throw some light upon this important question at the Idaho station a number of crosses were made during the season of 1915. A study of the following table may be found of interest in this connection:

TABLE 6.—CROSS-POLLINATION OF APPLES 1915—STATE OF IDAHO.

Cross	Number blossoms pollinated	Number fruits set	Per cent of fruit set
Rome x Newtown.....	100	10	10.0
Newtown x Rome.....	200	30	15.00
Rome x Gravenstein...	120	1	.83
Jonathan x Newtown..	260	71	27.3
Newtown x Jonathan..	200	69	34.5
Jonathan x Rome.....	140	36	25.7
Grimes x Wagener.....	300	4	1.33
Wagener x Grimes....	180	19	10.5
Grimes x McIntosh....	16	2	12.5
McIntosh x Grimes....	100	8	8.0
Grimes x Gravenstein..	30	0	0
Spitzenburg x Grimes..	20	7	35.0
Wagener x McIntosh..	120	9	7.5
McIntosh x Wagener..	80	4	5.0
Wagener x Gravenstein	100	0	0
Gravenstein x Wagener	160	36	22.5

These results show that certain crosses give better results than others. For instance, Jonathan X Newtown gave a 27.3 per cent of fruit, which would be considered a normal set, if 31.8 per cent represents approximately a normal set under natural conditions. A combination of Jonathans and Romes would be good economy in view of the fact that approximately 26 per cent of a set of fruit was obtained. On the other hand, one would hesitate in planting Romes and Gravensteins together, as only .83 per cent of fruit set. Likewise the same is true of Grimes and Gravenstein. Before definite conclusions can be drawn further, experimentation is necessary, but on the face of the evidence presented, it is apparent that all varieties will not cross with each other.

Therefore, in the selection of a pollenizer, the following points should receive due consideration: First, there must be a mutual affinity between the varieties planted together; second, the two varieties must bloom at approximately the same time; and third, the varieties should be good pollen producers.

Those who have orchards just coming into bearing, or old orchards for that matter, planted with one or two varieties which are shy pollen producers, should graft over one tree at least out of every ten with some other variety that is an abundant pollen producer, and blooms at the same time as the others.

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Bees and Pollination.

In a discussion of the subject of orchard pollination, the question of bees should not be overlooked, for cross-pollination will not be effective unless insects are present to carry pollen from tree to tree. The wind is a very poor conveyor of pollen, hence the orchardist depending entirely upon this agency in fertilizing his trees will meet with disappointment. Mr. E. B. Kelly, Horticultural Inspector for the Spokane Valley, is confident that lack of pollination in his district is due largely to the absence of pollen-carrying insects. This is apparently true in practically all commercial fruit districts of the Northwest.

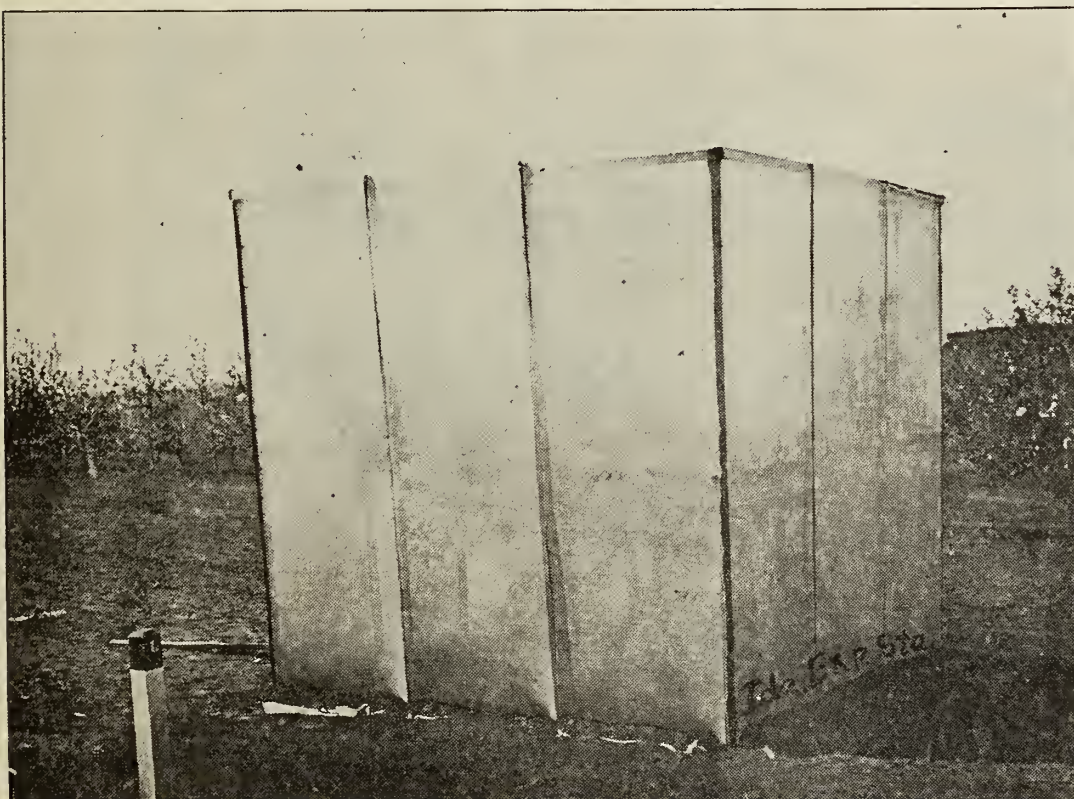
The experiments conducted by the University of California with prune trees confirm these points. Their results seem to warrant the following conclusions:

(1). Both the French and Imperial prunes may be aided in setting fruit by the use of bees in the orchard during the blooming period, provided the trees are in a normal, healthy condition.

(2). The absence of bees in the orchard may mean a low percentage of set with both these varieties.

(3). The French prune does not absolutely require interplanting with the Imperial, even though this arrangement may prove beneficial to both varieties.

In conclusion therefore I wish to say that the introduction of a number of hives of bees in the orchard, one hive to the acre, especially during the blooming period would unquestionably increase the normal set of fruit.



Showing one of the cages used in making the tests.

Observations on Treatment of Winter-Injured Trees

By W. H. Walton

EXPERTS in horticulture both in the Pacific Northwest and elsewhere who have had experience with fruit trees that have been injured by low temperatures are advising orchardists to proceed with caution in their treatment. It is pointed out by these authorities that the winter is not yet over and until such time as it is and the extent of the injury more definitely known, it will be the part of wisdom not to take action hastily.

Growers Should Be Cautious

Reports from the various sections of the Northwest are to the effect that stone fruits, particularly peaches, have been more severely hurt than apples and pears, and that the latter are apparently injured to a greater extent than apples. In the Willamette valley district of Oregon, where almost record low temperatures for this district were recorded it is not believed by Prof. C. I. Lewis, former chief of the division of horticulture of the Oregon Agricultural College, who investigated this section, that the injury is as great as at first reported and he is advising growers not to act on hastily made conclusions which would subject their orchards to too heavy pruning.

In the Hood River district which was subjected to still lower temperatures than the Willamette valley, Gordon G. Brown, horticulturist at the Hood River

Experiment station is advising the same plan of operation. In writing of the injury and the treatment for it Mr. Brown says:

Apple and Pear Injuries.

"Now that the trees have thawed out, many of the older orchards are showing serious injury as a result of the recent freeze. In most instances the injury is definitely located in the trunk and main body of branches where the cambium is prominently discolored. The injury appears for some distance above and below the level to which the snow had settled. As a rule the greatest destruction took place between the two and four-foot levels. An examination of the cambium tissue at greater heights above the ground showed that the trouble lessened and gradually disappeared altogether. Hence, an examination of the smaller, younger growths, which in many cases show no injury whatever, does not offer any clue as to what may be found in the main body of the tree. This injury is found both in apples and pears and the peculiar fact is found that the injury apparently bears no definite relation between trees on different soils, sites or under different orchard management. Apples appear to show considerable difference in resistance to injury. Baldwin and Arkansas Blacks appear to be highly resistant, while Jonathans, Ortleys and Spitzen-

bergs to be less so, and the Newtowns give indications of being the least resistant of any of the varieties examined.

Pruning Recommendations.

"Despite the fact that the injury is quite severe, the situation has a very hopeful aspect. It is found most prominently on the south or southwestern portions of the tree. However, the opposite side of the tree or limb is much less affected and should be able to function when the growth starts. Therein lies the hope for trees so injured.

"Should the most severely injured portions fail to resume growth normally there is considerable danger from sunscald next summer against which the grower should guard. Applications of Bordeaux whitewash to such parts next summer should prove effective in such cases where the body of the tree is exposed directly to the sun. Otherwise heart-rot fungus may gain entrance to the tree.

"Where trees are severely injured I believe heavy pruning next spring will be effective in strengthening the tree. This in case the tree has an excessive amount of top. In cases where the trees have made normal growth and the top is already thinned out I do not believe the case calls for special treatment. Whether applications of nitrate of soda will help is very problematical since it

Continued on page 34.

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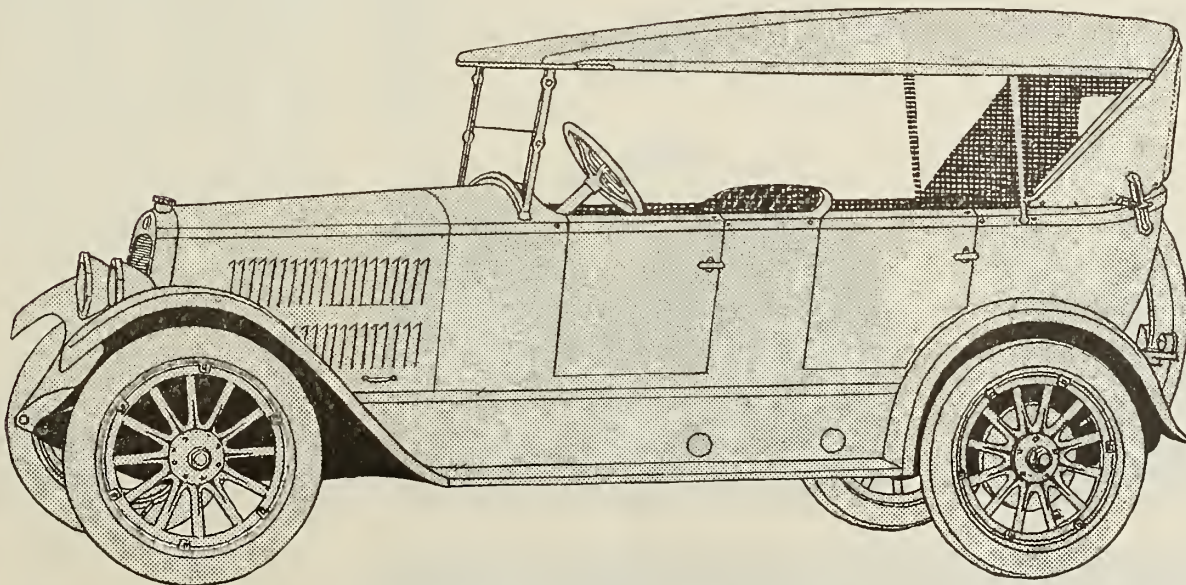
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WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Managing Bees from a Production Standpoint

By Geo. S. Demuth, Agricultural Assistant, Bee Culture Investigations,
United States Department of Agriculture

IT is important to note that four essential factors enter into the securing of a crop of honey: (1) A sufficient amount of bloom of healthy and well-nourished nectar-secreting plants growing in soil to which they are adapted and within range of the apiary. (2) Weather conditions favorable to nectar secretion and bee flight. (3) A large number of workers in excess of those needed for the routine work of the colony. (4) Conditions of the colony making the storing instinct dominant. If any one of these factors is absent, the effect of the other three is immediately nullified, and the amount of honey secured will vary as these factors are present at the same time in greater or

less degree or as the time during which they are all present is longer or shorter. It is therefore possible to have each of these factors present at some time during the season without securing a crop of honey. The period during which they are all present at the same time is usually quite short.

Grouping the first and second factors, we have a combination usually spoken of as the locality and season. These factors are largely beyond the control of the beekeeper except that (1) he may choose a location in which both are usually present at some time or times during the season, (2) he may take advantage of the plants of several locations by practicing migratory bee-

keeping, or (3) he may improve a given locality by directly or indirectly increasing the amount of nectar-secreting plants, such as buckwheat, alsike clover, sweet clover, or alfalfa.

In the third and fourth factors we have conditions capable of being brought about by management and for which the beekeeper is more directly responsible. The beekeeper's skill therefore lies in supplying and maintaining these factors throughout the short period during which the bees may store more than they consume. In order to do this he should know which plants may be expected to furnish the nectar for his crop of honey, that his various operations may be properly timed. It should be noted that the shorter the duration of the honey-flow, the greater becomes the necessity of having the colonies in proper condition at its beginning and keeping them so until its close.

Nectar may be available in abundance and the weather may be ideal for gathering and storing, yet no honey can be produced if there is not a large force of workers in each colony, in excess of those needed for colony maintenance, to gather and store the honey crop. Furthermore, nectar may be abundant, weather conditions ideal, and the colonies strong, with the results in honey secured meager or none at all because the beekeeper has failed to keep the forces of each colony together and the storing instinct dominant. It is a common occurrence among inexperienced beekeepers to have the colonies become strong enough to work in the supers only after the flowers have ceased blooming or to see strong colonies during a good honey-flow doing nothing in the supers simply because conditions are not such as to make the storing instinct dominant.

So far as the skill of the beekeeper is concerned in the production of the crop of honey in a given location, every manipulation of the season should be directed (1) toward securing the greatest possible number of vigorous workers at the proper time, and (2) keeping the entire working force of each colony together and contentedly at work throughout the given honey-flow.

Securing Workers for the Honey-Flow.

The management directed toward securing workers for the honey-flow begins during the previous late summer and early autumn. It includes (1) providing favorable conditions for the production of the bees that constitute the winter colony; (2) conserving the energy of these bees during the broodless period of winter, when they can not well be replaced by further brood-rearing; and (3) building up the population of the colony after the adversities of winter so that the maximum strength is reached at about the beginning of the main honey-flow.

The function of the beekeeper is first to see that each colony is in normal condition and headed by a good queen in time to produce the bees that form the winter colony and then to supply any deficiency in food, protection, and room for both brood-rearing and stores that may exist at any time during the three periods mentioned above.

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Food, protection, and room are the three requirements for colony existence and prosperity. Most failures to have colonies profitably strong at the beginning of the honey-flow are due to negligence on the part of the beekeeper in supplying, in advance of the needs of the colony, any deficiency that may occur in one or more of these requirements.

Production of Bees for the Winter Colony.

Fall Stores and Room.—During late summer and early autumn, when the bees are reared that make up the winter colony, a deficiency in either stores or room for brood-rearing may so restrict the production of young bees that their number may be too low for successful wintering. Colonies that are abundantly supplied with stores and have sufficient brood-rearing space at this time usually continue to rear sufficient young bees even in the absence of a fall honey-flow or any stimulative feeding. This is especially true if the queens are young.

Winter Stores—Before the beginning of cold weather each colony should have available at least a sufficient quantity of stores to supply the needs of the bees until late spring. In the northern states, where bees wintering out of doors do not have frequent flights or where bees are wintered in the cellar, it is exceedingly important that the winter stores be of the best quality, such as honey which contains the min-

imum amount of gums or a sirup made of granulated sugar. If inferior honey is present in the brood-chamber when brood-rearing ceases in the fall, the defect may be remedied by feeding at this time about 10 pounds of heavy sugar sirup to each colony. This will be stored where it will be immediately available for winter consumption, thus leaving the inferior stores for spring consumption when they do no harm. Any deficiency in either quantity or quality of winter stores should be supplied immediately after brood-rearing ceases or earlier.

Conservation of Energy of Winter Colony.

Winter Protection—During the broodless period of winter the life of the worker bees must be greatly prolonged in order that the colony may survive. The energy of the bees must be so conserved that they will live six months or more instead of six or eight weeks, as in the active season. Bees live most slowly when they are broodless, undisturbed, and have a temperature within the hive of 57° F. to about 65° F. When the temperature within the hive goes below 57° F. the bees become more active in order to maintain the minimum of 57° F. within the cluster. When the temperature within the hive goes above about 65° F. the bees begin some of the activities similar to those of the summer season. For best results in wintering, it is necessary therefore for the beekeeper to provide

abundant protection against cold and wind either by wintering the bees in the cellar or by protecting them out of doors. (See Farmers' Bulletin 695.)

Increase in Population.

During spring, while still anxious that bee-energy shall not be wasted, the beekeeper desires that it be spent judiciously in brood-rearing. For best results the maximum of colony strength should be reached about the time the honey-flow begins.

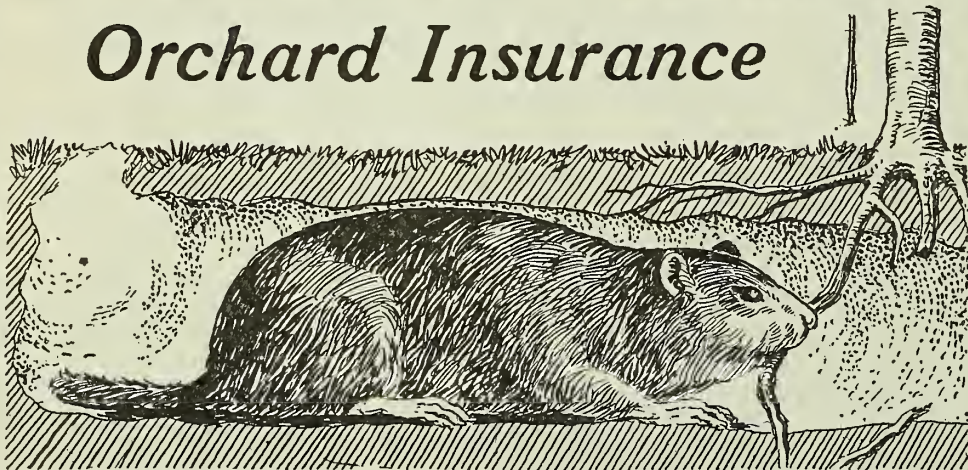
In most localities suitable for the production of comb-honey there is during the season but one honey-flow that furnishes any considerable surplus suitable for comb-honey, with perhaps minor honey-flows either meager in quantity or furnishing honey unsuitable in color. Furthermore, in these localities the main honey-flow usually occurs so early in the season that only those colonies provided with the best environment are able to build up to profitable strength to take advantage of it. In other localities the main honey-flow may occur later in the season or the season may furnish a series of important honey-flows with sometimes long intervals between them. Each type of location furnishes its own modification of the problem.

Spring Stores—When brood-rearing is resumed in the spring the consumption of stores is greatly increased over that of winter and as spring brood-rearing approaches its maximum the daily consumption of stores increases until an enormous quantity of honey is used for this purpose. At this time there is great danger of the colonies running short of stores, especially if no nectar is being brought in from the fields. Colonies that run short of stores during the spring rear brood sparingly and are so severely retarded in development that they usually attain profitable strength too late for the honey-flow. All colonies should be so abundantly supplied with stores for winter that there will be plenty left for early spring brood-rearing. If this was not done an early spring examination of all colonies is necessary to find which need more stores. Any deficiency in stores should be supplied immediately by inserting frames of sealed honey saved from the previous year or by feeding sugar sirup. Each colony should have at this time at least 10 to 15 pounds of honey in excess of their daily needs. Some beekeepers practice feeding each colony a small amount of sugar sirup daily to stimulate brood rearing. This should not be done during early spring, but under some conditions may be profitable during the few weeks just previous to the beginning of the honey-flow. Extensive producers, however, usually prefer to give 10 or 15 pounds of sealed honey or to feed an equal amount of sugar sirup at one time to colonies that are short of stores in the spring.

Spring Protection—A good hive that conserves the heat of the colony is a great help in early brood-rearing. Some beekeepers who winter their colonies in the cellar in single-walled hives find it

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profitable to put them into winter packing cases after they have been removed from the cellar. When colonies are wintered out of doors in winter packing cases, it is well to leave them packed until late spring. In the northern states double-walled hives are especially advantageous during the spring if bees are wintered in cellars. A location for the apiary that is well protected against cold winds is also of great importance in spring brood-rearing.

Room for Spring Brood-Rearing—There should be no restriction whatever in the room for brood-rearing up to the time of putting on the supers, just previous to the honey-flow, for a crowded brood-nest at this time tends to diminish the number of workers available for the honey-flow as well as to encourage swarming.

If the space for brood-rearing should be restricted by too much early honey in the brood-chamber, some of the heaviest combs should be removed and empty ones given instead, or an extra brood-chamber containing empty combs may be given. In localities where considerable early honey is gathered the brood-chamber may be kept almost free of honey by placing an extracting super over each colony at the beginning of such a honey-flow. This super should not be removed until the comb-honey supers are given, for the honey they contain may be needed later in brood-rearing.

Should the brood-nest be restricted by a small brood-chamber, more room may be given either by removing some frames of brood from the stronger colonies, exchanging them for empty combs taken from colonies less strong, or adding another brood-chamber filled with empty combs. The former method has the following advantages: (1) After being built up to approximately the same strength, most of the colonies will be ready for a given manipulation at the same time, thus facilitating the work of the beekeeper. (2) It requires a smaller stock of extra brood-chambers and combs, at least previous to the honey-flow. (3) The brood is in a more compact form, which is a very desirable condition in comb-honey production. (4) When properly done, the total number of young bees reared in a given time is probably considerably greater, owing to the fact that none of the colonies is strong beyond the capacity of the queen, the workers of the entire apiary being so distributed that all the queens are utilized to the best possible advantage. (5) When the honey-flow begins the colonies are ready for the supers without additional labor, such as removing extra brood-chambers, sorting combs of brood, etc. In equalizing colonies combs of emerging brood with the adhering workers, **without the queen**, are usually drawn from the strongest colonies and given to colonies less strong, but **never to very weak colonies**. The weakest colonies are left until the last, then built up quickly provided there is time enough to have all the hives well filled with brood. If this is not possible the very

weak colonies can more profitably be used for purposes other than comb-honey production. Another plan of equalizing is that of shaking bees from combs taken from strong colonies at the entrance of colonies less strong. The older bees at once take wing and return to their hives, while the younger bees enter the weaker colony. The operator must, of course, be sure the queen is not on the comb thus shaken.

Some of the advantages of using a second brood-chamber, thus building up the colonies as individuals, are: (1) The labor required is considerably less, fewer visits being required, so that this method is particularly adapted to out-apiary conditions. (2) It is possible to determine with much greater accuracy which colonies show the most desirable traits for breeding purposes. (3) It can be more safely practiced if brood diseases are imminent.

The Critical Period in Spring Brood-Rearing.

With the single short major honey-flow, which is characteristic of most localities that are suitable for comb-honey production, the entire honey-crop may be gathered and stored by the workers that are reared within a period of six or eight weeks. Except when the honey-flow is of considerable duration, the eggs that produce the workers that gather the crop are laid before the honey-flow begins, since those that develop from eggs laid later are not ready for work until after the close of the honey-flow. On the other hand, the workers that emerge six weeks or more previous to the beginning of the honey-flow will have died of old age or are too old to be of much value during the honey-flow.

This limits the time of the production of the bees that actually gather and store the honey-crop to a certain definite period, which puts an importance upon brood-rearing during this time far above that of any other period during the year. All the other bees that are reared during the entire year may be considered by the beekeeper as useful only inasmuch as their labors contribute to the rearing of an enormous quantity of brood within this critical period of brood-rearing and to the maintenance of the normal strength and the existence of the colony during the remainder of the year.

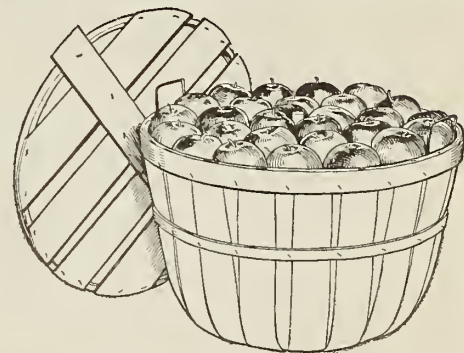
Colonies that are not strong enough to care for a large amount of brood during this, the most important period of brood-rearing must utilize the honey-flow to build up to maximum strength and are therefore unproductive this season.

Colonies that are strong enough for heavy brood-rearing at the beginning of this critical period are frequently rendered unproductive for the season by a cessation or restriction of brood-rearing during this period caused by insufficient stores or insufficient room. Such colonies begin the harvest with old, worn-out workers, and usually give poor results. This may explain to some extent the belief among beekeepers that colonies may become strong too early. It is therefore highly important (1) that

each colony be in a normal condition at a period six or eight weeks previous to the honey-flow, and (2) that brood-rearing be at its maximum for the entire period of six or eight weeks during which the brood is reared to produce workers that will be available for the honey-flow.

To have colonies sufficiently strong in time for the critical period of brood-rearing involves the management of the previous late summer, autumn, winter, and early spring. To keep brood-rearing at its maximum during this period requires only the presence of favorable conditions which if not already present are easily supplied by the beekeeper during the short period when the workers that gather the honey-crop are reared.

An abundance of stores in excess of the immediate needs of the colony sufficient room in the form of empty worker-combs for the heaviest possible brood-rearing, and a good queen are the most important factors to insure unrestricted brood-rearing during this, the most important period in the year's cycle of brood-rearing. It is not sufficient to have only enough stores to maintain the colony at this time, since, long before there is actual danger of starvation, brood-rearing is greatly reduced or even suspended, and some of the immature young are carried out of the hive. Any possible deficiency in either stores or room should be supplied promptly by the beekeeper in advance of the immediate needs of the colonies.



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Fruit Crop Prospects.

Unprecedented cold weather has undoubtedly injured almost all fruit plant life in the northwest although the definite extent of the injury will not be known until the season is sufficiently advanced for new growth to commence. Stone fruits are believed to have been more seriously injured than apples and pears while cane fruits in many districts were nipped quite severely above the snow line.

With apples, which constitute the most important crop grown in the northwest it is natural to conclude that the injury was sufficient to cause a considerable reduction in the 1920 crop although this may not prove as serious as was at first thought. According to all precedents the 1920 apple crop, even if there had been no winter-injury, could not be expected to be as large as that of last year as orchards in this territory where soil and other growing conditions and proper cultural methods were pursued, invariably bore heavily. In other words 1919 was the heavy bearing year and the coming season should therefore be expected to produce only a moderate crop. The pear production in 1919 was also very heavy but the tendency of this fruit is to produce more evenly than apples. Reports now seem to indicate that pear trees were seriously damaged.

The fruiting tips of cane fruits undoubtedly suffered some damage which will result in a more limited crop on the older plantings. New acreage which was largely covered by the snow will not be much affected and no harm is expected to have resulted to strawberries. It is believed therefore that the berry crop will be little less this year than the 1919 output and that it may be considerably larger.

The outlook for prunes, peaches and cherries is problematical, although if prune trees were only slightly injured there should be a larger crop in the northwest this year than last when the crop was far below normal.

Reports received to the present time indicate that the situation is serious but far from discouraging and that while the coming season will not see the large production of 1919 it should result in the harvesting of a tonnage that will be fairly normal, considering all contingencies.

Spraying.

The spraying program which should be commenced soon by the progressive fruit grower is the most important as a marketable crop producer of any of the operations in an orchard. No grower who wants to make it possible to obtain the maximum income from his orchard can afford to take any chances

in omitting sprays. In the past two years with the big advance in the price of fruit this fact has been driven home to the orchardist more emphatically than ever before. As a result spraying has been done more scientifically, more thoroughly and more generally and reports are to the effect that the largest as well as the cleanest crop of apples ever produced in the northwest was harvested in 1919.

Spraying is an operation that must be done intelligently. It is not sufficient to throw the spray on the trees in any old way trusting to luck that it will "take." The utmost care should be taken in the selection of the materials to accomplish the purpose for which the spray is being used. It should be applied at the right time and the application so directed that it will accomplish the maximum results. Those who are not getting these results should make a study of the methods of those who are and also consult authorities on the subject. In many instances this means not only better results but economy in material and labor as well.

In this particular, efficient equipment plays a very important part. In the rapid progress which is being made in the use of sprays and in applying them a grower who fails to keep himself informed will discover later that he has lost both time and money by not adopting the improved methods and equipment.

Of late spraying, has to some extent been made much simpler by the use of combination sprays where they will serve a double purpose. For this reason it will be well for growers to consult the diagram and table published in another part of this issue. In applying these combination sprays the fruitgrower should remember that they must be selected with caution and used for the purposes designated. Map out your spraying program in advance; know what it is necessary for you to do in this regard; the time that it should be done; apply the spray correctly and the results will show for themselves.

Prunes a la Eastern Prices.

A Roseburg, Oregon, lady who was visiting in the east, 3,000 miles away from home, was served four Oregon prunes in a high-class hotel for which she was charged 50 cents, according to a report from the turkey metropolis. Not so bad, after all, when you consider that two Oregon hen fruit served in Portland, Oregon, the hub of the state cost anywhere from 35 to 65 cents.

Geographically Speaking.

Billie Strandborg, publicity man for the Portland Railway, Light & Power Company, who recently returned from a trip east tells us that New Yorkers think Hood River apples are grown in Washington and that Cleveland people opine that Wenatchee apples are produced in Oregon. If he had inquired in Chicago he might have discovered that the residents of the Windy City think that Tillamook cheese is made in the Hawaiian Islands. It seems that

the geography of easterners is still very much mixed notwithstanding the magnificent eloquence of Frank Branch Riley. However, geographically speaking Libby, McNeil & Libby recently discovered through the operation of the government food act that pears grown and canned in the state of Washington are not grown and canned in California and will so announce next season.

Pruneizing the United States.

Robert C. Paulus, manager and C. I. Lewis, organization manager, respectively of the Oregon Growers' association, have figured out that in order to profitably market the rapidly increasing U. S. prune crop, that each inhabitant must, in the near future consume 3 and one-half pounds of prunes per annum. Up to the present time it hasn't been decided just how this per capita dose of prunes is to be taken—that is whether the allotment must be gormandized at one fell swoop or be consumed in homeopathic quantities each morning for breakfast. But, the fact remains that Messrs. Paulus and Lewis and other authorities on prune crop production have decided that the American people, with what foreign assistance they can get, must take these prunes.

The campaign to accomplish this result will not be one of coercion, but of persuasion through the channels of national advertising and a much wider distribution. With the plantings already on the Pacific coast the prune crop in the next few years is expected to reach more than 300,000,000 pounds.

For the Idle Moment.

Bees accomplish nothing save as they work together, neither do men.—Hubbard.

Cultivators of the earth are the most valuable citizens. They are the most vigorous, the most independent, the most virtuous; and they are tied to their country and wedded to its liberty and interests by the most lasting bonds.—Thomas Jefferson.

Sour soils and sour dispositions are both bad for the farm. Men think that a little sweetening of the soil with lime would produce such good results that the farmer's disposition might also be sweetened.—Exchange.

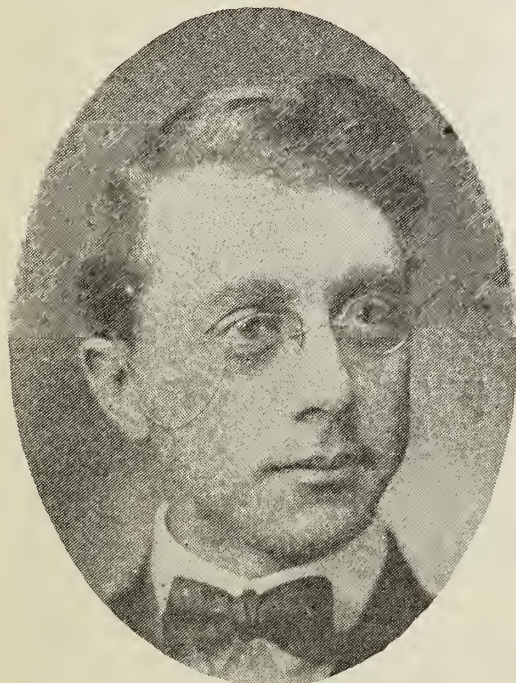
The belief is crystallizing that faith isn't dead in the world yet. Farmers are still shipping fruits and vegetables to fly-by-night commission merchants, with offices in their hats and fountain pens and typewriters as capital.—Fruit Trade Journal.

The Oregon Growers' Coöperative Association believes that the fruit growers are entitled to a fair profit on their investment, to a fair return for their labor, to an allowance for depreciation. We believe the middle man and the retailer are entitled to fair profits. The speculator, however, has no place in the marketing of food products.—The Oregon Grower.

That the price of fruit, particularly apples, in the future will only justify the conservative planting of orchards is the opinion of W. J. Green, horticulturist at the Ohio Experiment Station. Mr. Green points out that the enormous crop of apples a few years ago really resulted in a loss as the over-production reduced the price to such an extent that orchard owners could not even pay for the expense of handling the apples. This year with Ohio producing approximately not more than 30 per cent of an average crop, the price has risen to \$7 and \$8 per barrel for apples shipped out of orchards and from 8 to 12 cents a pound for apples retailed in grocery stores. It would not be safe to start extensive planting expecting to receive the present high prices. Mr. Green believes, however, that the price of apples in the future will adjust itself profitably to the grower who sets out orchards containing varieties of general commercial importance.—Ohio Experiment Station Bulletin.

Appointed Horticultural Chief at O. A. C.

Prof. W. S. Brown, who has been acting chief of horticulture at the Oregon Agricultural College since the resignation of Prof. C. I. Lewis, has been regularly appointed to that position by the college board of regents. Mr. Brown graduated from Cornell University in 1904, specializing in horticulture and was a student under such noted men in the field of horticulture as John Craig



PROF. W. S. BROWN

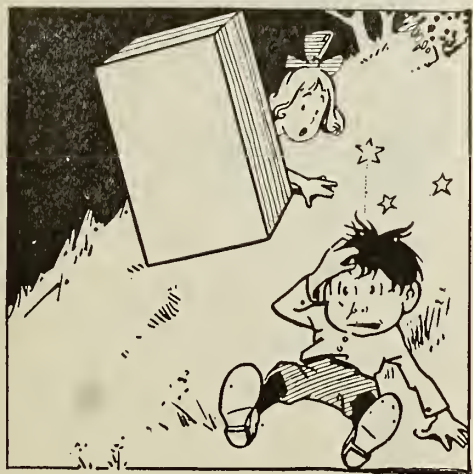
The new Chief of the Department of Horticulture Oregon Agricultural College

and L. H. Bailey. Before entering Cornell he had taken a degree at Alfred University in 1899 and had engaged in the profession of civil engineering.

On graduating from Cornell he became connected with the University of Wisconsin as instructor in horticulture. While there he pursued a post graduate course in horticulture and received his

degree in H. S. in 1906. Later he took charge of the horticultural department at the University of Agriculture at Winoona, Indiana. On coming to Oregon in 1908 he organized a company to engage in the commercial orchard business and was manager of this concern for several years. At the end of this time he accepted an appointment as extension specialist at the Oregon Agricultural College and in this capacity visited all parts of the state and became familiar with its needs in successful fruit production.

In the spring of 1919 he was appointed professor of pomology and has been acting chief of the department of horticulture up to the time of accepting the regular appointment. Owing to the rapidly increasing growth of the fruit industry in Oregon this department is now regarded as one of the most important under the direction of the college. It includes the departments of pomology, vegetable gardening and landscape gardening as well as all horticultural products. There are now engaged in this work at the college a staff of 14 members which is covering all phases of the work. In fact these branches of agriculture have been taken up so thoroughly at the Oregon Agricultural College that it is said there is but one other college in the country that offers a greater variety of instruction in horticulture. To carry out the work with the greatest degree of efficiency a horticultural products laboratory was recently placed in use at the college that for completeness is said to be the only one of its kind in the United States and has already contributed to the solution of some of the most important problems in the field of horticulture. As the head of this important work, Prof. Brown, with his staff of competent assistants, is expected to render valuable service to the horticulture of the state and nation on account of his special fitness for the position.



*Jack and Jill went up a hill
To fetch an empty box
Jack fell down and broke his crown
But Jill climbed in the box.*

Needless to say Jill showed discretion because it was a **Bloedel Donovan** box—strong and tight—built to withstand hard knocks.

If it's worth sending—pack it right. If it's worth packing make it strong and safe. Use a **Bloedel Donovan** box and be sure.

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SUPERINTENDENT WANTED

To take full charge of an 80-acre bearing orchard near Hood River, Oregon, on share basis. Applicants must state their experience in apple raising, irrigation and gasoline engines, also mention their age and number in family.

Address E. M. RIETZ, care Better Fruit

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THE FIRST NATIONAL BANK WEST
OF THE ROCKY MOUNTAINS

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I will sell my entire ranch of 70 acres, 43 acres of which consists of from 10 to 12-year-old well taken care of trees and 27 acres of improved farm land, well supplied with irrigation water, 4 miles from railroad station, good roads in all directions. The trees are mainly McIntosh Reds, with a few Delicious and other good varieties. 1919 crop was 4,000 packed boxes. On it there is a 4-room dwelling, barns, chicken sheds and other outbuildings, a 28x40-foot packing house with cement basement. Will take \$500 per acre. This is a bargain and will bear investigation. Reason for selling, other business. CHAS. PENTTILA, 509 Jackson Street, Eveleth, Minn.

FOR SALE

Ten-Acre Orchard — Spitzenbergs and Yellow Newtowns — ten years old, in the Willamette Valley, Oregon — Price \$5,000. Half cash—terms on balance.

Box S, care Better Fruit

BEARING PEAR ORCHARD FOR SALE

Twenty acres of 10-year-old pears; about 12 acres planted to Boscs and the balance to Bartletts and Howells. Tract half a mile from station at Sutherlin, Oregon, on a paved road. Land under irrigation. The trees have always had fine care and are large and thrifty. Sutherlin is located in the heart of the Umpqua Valley, where climatic conditions cannot be excelled. The town is alive and progressive. A large new cannery and packing house was established there last year.

Price for this orchard is \$16,000; \$6,000 cash, balance on time at 6% interest. Address the owner, Maude B. Luse, 820 Spalding Building, Portland, Oregon.

The Natural Tree Brace—Home Grown Fruit Stocks

By G. F. Richards, Fishkill, New York

BETTER FRUIT, Portland, Ore.:—The December issue of BETTER FRUIT proving especially meaty reading to me I should like to add a word or two concerning some of the topics discussed.

The article on natural bracing young trees meets my hearty endorsement. I have followed the practice for the past ten years, for a majority of that time on an orchard containing about two hundred acres of apples, and find it to be a good investment of time.

In fact I have been able to make a sweeping refutation of the charges brought against the practice by some of the wisecracks who declared the scheme impractical on the following counts:

First—The braces would never knit. Second—They would never get large

enough. Third—Pickers would break them off by standing on them when picking the center of the tree. Fourth—The interstices between the branches would prove a lodging place for every kind of insect, scale and fungus. Fifth—The braces would grow a lot of watersprouts and make a lot of extra pruning; and sixth, that it was a darn fool idea anyway.

I have found it of especial benefit where trees have been pruned to an extreme vase form, and in strengthening the tops of topworked trees which are making excessive growth.

My practice differs from your Washington correspondent in that I have worked with trees five years old and over. I make the braces while pruning in the spring, and find that it works

well. The stimulation due to pruning seems to give the braces a big advantage over those put in without pruning.

The only care needed after making the braces is to cut off any lateral branches which may spring from them, and after the brace has made a perfect union, which generally is in three or four years, to cut off the ends of the limbs forming the brace, which are generally stunted by that time, as the sap flows through the brace from trunk to trunk, giving less to the tip of the branch each year.

I have had splendid results with it in every variety (nearly thirty) I have tried it on, with the exception of the Wealthy. The reason for failure with that I think is that the trees had begun to bear, and in consequence had less strength to put into wood.

Taking it by and large I call it good orchard practice, especially in a district liable to high winds or heavy ice storms.

Now in regard to producing fruit stocks in this country. It has been done and I see no reason why it should not be done again.

I am intimately acquainted with an orchard which was started back in the late forties in the hill country of Massachusetts.

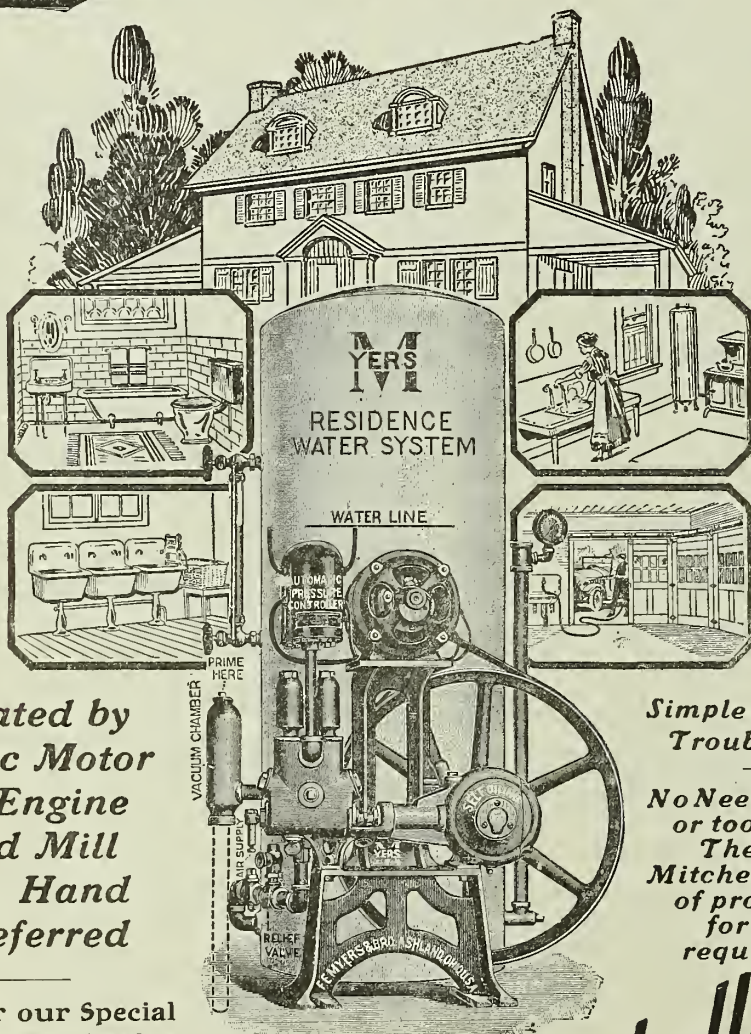
The owner started to grow a few trees as a hobby, washing out seeds from pomace, rejecting the inferior stocks and budding or root-grafting the stronger ones. He finally gave up his farming in favor of fruit production, and grew all his own trees for over forty years.

The last planting was made in 1890, making an orchard of over fifty acres.

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as having water under pressure, wherever desired, about the home and farm. Nothing makes for so much happiness in the home and eliminates so much drudgery. A dependable supply of water under any desired pressure is best and most economically furnished by a

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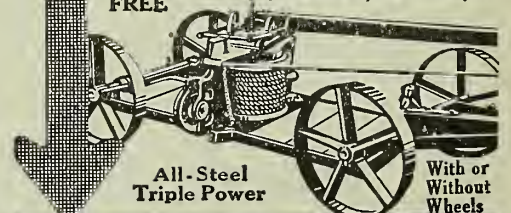
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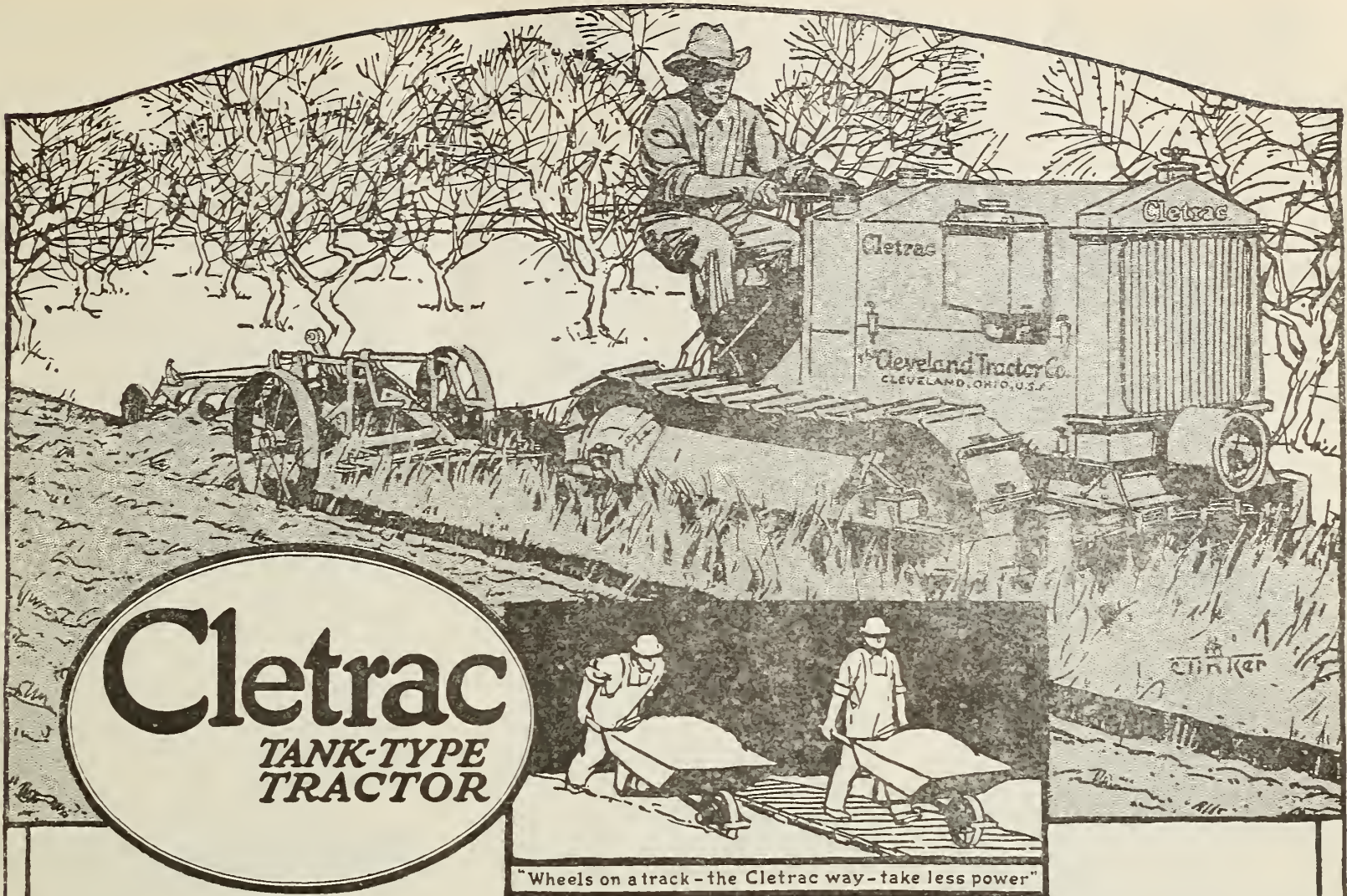
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Plow your orchard better this year—put a Cletrac on the job.

Small, powerful, easy to run—working every day, 24 hours a day if necessary—the Cletrac plows closer to trees, quicker and at lower cost.

Laying its own endless tracks, the Cletrac travels the orchard floor with a light, sure foot and a strong, steady pull.

Long-hung, with no projections—it weaves in and out and around trees without injuring bark or branches. Turns short—gets the corners, works in the sticky places—goes everywhere, with power to spare.

The Cletrac rides on top of the soil—doesn't pack it. That's why it's so good for discing and other mellowing jobs.

Spraying, ditching, fertilizing, road building, operating cooper shops and cider mills—these are but a few regular Cletrac jobs. All the year around—any time, anywhere—it does all your haulage and belt work. Operates perfectly on distillate or kerosene.

The Cletrac costs less to operate than any similar power unit or the six or eight horses it replaces—works more hours a day and more days a year, too.

Be ready when the rush comes—get your Cletrac now.

Write today for that interesting booklet
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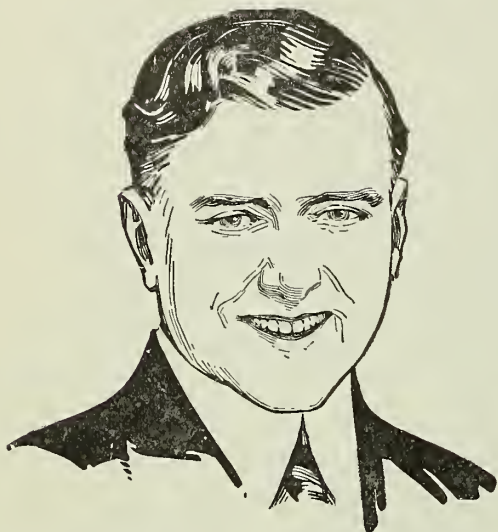
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You have found, no doubt, that brushed teeth still discolor and decay. The methods you use are inadequate. There is now a better way.

The cause of most tooth troubles is a film. It is ever-present, ever-forming. You can feel it with your tongue.

That film is what discolors—not the teeth. It is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea.

That film is clinging. It gets into crevices and stays.

So, despite your brushing, it may do a ceaseless damage. Teeth are safer, whiter and cleaner if that film is absent.

Science Now Combats It

Dental science, after years of searching, has found a way to combat film. Years of careful tests under able authorities have amply proved its efficiency. Now leading dentists all over America are urging its adoption. It is now used daily on millions of teeth.

This film combatant is embodied in a dentifrice called Pepsodent. And a 10-Day Tube is offered to every home for testing.

Pepsodent is based on pepsin, the digestant of albumin. The film is albuminous matter. The object of Pepsodent is to dissolve it, then to day by day combat it.

For long this method seemed impossible. Pepsin must be activated, and the usual agent is an acid harmful to the teeth. But science has discovered a harmless activating method. And that discovery opens a new teeth-cleaning era.

The results are quickly apparent. A ten-day test is convincing. We urge you to make it at our cost and learn what clean teeth mean. Lest you forget, cut out the coupon now.

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Make this ten-day test. Note how clean teeth feel after using. Mark the absence of the slimy film. See how teeth whiten as the fixed film disappears. In ten days let your own teeth tell you what is best.

Ten-Day Tube Free

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Mail 10-Day Tube of Pepsodent to

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Address

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

The trees are still vigorous and producing crops of quality fruit. In fact buyers bid higher for the fruit from this orchard on account of its bright color and good size, as compared with other fruit in the district.

Fruit from this orchard won prizes at the Paris exposition in 1900 as well as at innumerable local exhibits.

In thirty years which I can vouch for, the only trees lost from the orchard were: Two struck by lightning; about two acres of fall apples which succumbed to San Jose scale before it was well understood, the trees being about thirty-five years old at the time; five acres of Northern Spy planted on uncongenial soil, and some of the older plantings which outgrew their allotted forty feet of space were thinned out to stand eighty feet each way. The orchard still bears well, in 1916 bearing 3000 barrels of apples, the average crop being 1000 to 1500 barrels.

In my estimation that orchard is living proof of long-lived, disease resistant, crop producing native stock, and I hope to see the day when imported stocks will be the exception rather than the rule. Certainly it is here to be developed. All we need is a few years time and a few hard headed men to develop it.

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MILTON, OREGON
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FULL LINE OF NURSERY STOCK.
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National Thrift Week

to be celebrated January 17 to 24, shows the importance that Uncle Sam ascribes to the good old-fashioned virtue of thrift.

The schedule for the week embraces several things that every good citizen should put into his regular scheme of life. It is a good time to take account of your own personal finances, and see whither you are tending.

LADD & TILTON BANK
Oldest in the Northwest
Portland, Oregon



WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Northwest Fruit Notes from Here and There

OREGON.

The Ashland section has had the most prosperous year in fruit in its history according to A. C. Briggs, manager of the Ashland Fruit and Produce association, a cooperative marketing concern. The association did a business of \$150,000 during the past year and recently has bought a property adjoining the present warehouse in order to extend its operations. The new directors recently elected are J. H. Dill, A. S. A. Peters, J. M. Wagner, J. H. San der and S. J. Evans.

One hundred and twelve cars of apples sold by the Umpqua Fruit Union netted the growers of that district an average price of \$1.65 per box, the selling committee of the union recently reported.

High grade Oregon apples were recently selling for more in Portland than they were in San Francisco, according to a statement made by Walter R. Woolpert, manager for a large apple handling concern in the northwest, who says that Spitzenburgs were selling in Frisco for \$3.50 per box when they were bringing \$4.50 in Portland.

At the request of Senator McNary, D. F. Fisher, government plant pathologist at Wenatchee, it is reported will be sent to the Willamette valley, Oregon, to investigate damage reported in that section to walnut and prune trees. Senator McNary has an extensive walnut orchard in that district.

The Ideal Grading Machine Co., with headquarters at Hood River, is busy completing 15 apple graders which are to be shipped to New Zealand, Tasmania, and Australia. It is expected to ship the graders in time to reach their destinations for the coming apple harvesting seasons in these foreign countries, which comes on in April and May.

The strawberry acreage in the Hood River district will be largely increased this spring. Ten logged-off tracts that were recently purchased there from the Oregon Lumber company will be set to pears, with berries between the trees. On the west side of the valley, F. B. Mercer will set out 200,000 strawberry plants of the Clark seedling variety.

Clatsop county is going in for strawberries on an extensive scale this year for that section. Over 50,000 plants have been set and many more have been ordered for planting.

Loganberry patches in the Eugene district it is now reported were not injured as badly as was first thought and this is said to apply also to the other sections of the Willamette valley. Recent investigations show that the vines are developing buds under the influence of warmer weather.

At the annual meeting of the Oregon Growers' Cooperative association, which was recently held, the following were chosen as officers of the association: President, W. E. St. Johns of Sutherlin; vice-president, H. M. Harlow, Eugene; secretary-treasurer, Seymour Jones, Salem. St. Johns, Harlow and Jones, together with E. W. Matthews of Amity and B. W. Johnson of Monroe, constitute the executive committee of the association. M. O. Evans, formerly with Swift & Co., was selected as field manager of the association in place of Earl Percy, who resigned to become manager of a large orchard property in the Willamette valley. Isaac D. Hunt, who had been president of the temporary organization declined the office of president for the coming year on account of his health which will necessitate his being out of the state considerably during the coming year. Plans were discussed at the

meeting for the erection of six large packing plants to be located at various heavy fruit producing points in western and southern Oregon.

County Agricultural Agent Fluharty of Wasco county, reports serious injury to peach, apricot and cherry trees in that district from the freeze, although the heavy snows proved a great saving to many trees.

Returns from the apple crop in the Hood River valley for 1919 are expected to reach \$4,500,000 and pear returns will reach \$175,000. Cull apples were sold to the value of \$225,000 although 70 per cent of the crop is reported to have graded out extra fancy. It is estimated that \$500,000 was paid out for labor in harvesting and packing the Hood River apple crop. The Hood River Apple Growers' association handled 1,500,000 boxes of the total crop.

The Earl Fruit company, which bought the box factory of the Klamath Manufacturing company some time ago, for which it paid \$700,000, has assumed charge of the plant. The output of the factory will be used by the company to supply its various packing plants throughout the northwest with fruit boxes.

Although it is estimated that there are now 800 power sprayers in the Hood River valley, growers in that district are reported to be making extensive purchases of this kind of orchard apparatus for the coming year. The demand there for automobiles and tractors is also said to be heavy.

The Kings Products company, which was the pioneer institution in establishing dehydrating of fruit and vegetables in the northwest, and has plants at The Dalles and Salem, has shipped an immense tonnage of their products for eastern consumption during the past two months. The wholesale trade is reported as being favorable to handling these products owing to the great saving in freight charges over canned goods.

The Oregon Growers' Cooperative association, which controls 16,000 acres of fruit in Oregon, has opened a national campaign for a name. A hundred dollars is offered for the first prize, and fifty dollars for the second prize, for the best suggestion for a brand name. The Oregon Growers' Cooperative association will sell all kinds of fruits, such as apples, pears, cherries, berries, walnuts, and dried and canned fruits. The name must be one which can be applied to all. Since the association is a statewide organization, the name must not be localized, but must be appropriate to the entire state. The contest will close April 1. All names should be sent in to C. I. Lewis, organization manager, Masonic Building, Salem, Oregon. A short, catchy name is preferable to a long one. Such names as Sunkist, used by the orange growers of California, Sunsweet, used by the prune growers, and Skookum, used by the apple growers of the northwest, are good. Later an additional prize will be offered for the best design to go with the name. The contest is open to all, regardless of age, sex, or locality.

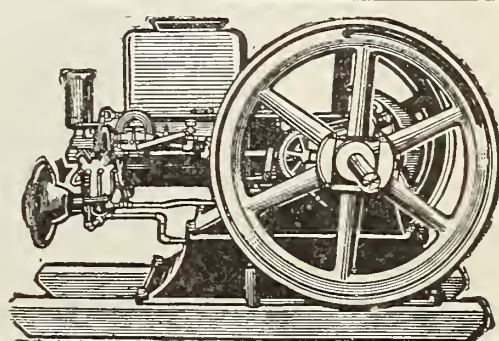
WASHINGTON.

What is claimed to be the first full ship load of apples ever shipped from the Pacific coast to an Atlantic port was scheduled to leave Seattle about the middle of January. Fifty cars of the cargo were secured in the Wenatchee district, 150 cars from the Northwestern Fruit Exchange, and the rest from other shippers, and is being sent through the Panama canal. It is stated that if the experiment is a success that the United States Ship-

ping Board promises to establish regular sailings of fruit steamers from the Pacific coast next year, sufficient to handle from 1,000 to 2,000 cars of apples. The initiatory work in starting this movement was taken up by Arthur M. Geary of Portland, at the request of English apple importing firms. In order to get cooperation Mr. Geary recently spent a month in the east conferring with shipping board officials and others who could aid in the matter. It will cost 70 cents per box to land the fruit at New York or about the same as the railroad charge.

At a recent meeting of the board of directors of the Washington Growers' Packing corporation, a cooperative organization of fruit growers organized along the lines of the Oregon Growers' association, L. F. Russell was elected president; Fred Brooker vice-president and Henry Crass, secretary. M. J. Newhouse, who was formerly county agent of Clarke county, and a member of the Washington State College staff has been selected as business manager. It is expected that the new organization will handle a large share of the fruit crop of Clarke county and nearby territory this year.

E. S. Robertson, horticulturist of the extension service of the Washington State College,



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who recently made an investigation of the damage done by the cold weather in the Yakima valley, is quoted as saying that peach buds were killed in most of the orchards in the valley, many of the trees probably injured and some of them killed. The apricot crop he believes will be cut short, but says that the trees were less injured than peaches. Cherry trees give evidence, according to his investigations of having been severely hit while

pears are only slightly injured. Prunes are said to have been hurt but little and apple trees not much injured except in orchards where the trees lacked vigor due to poor soil or other causes.

C. L. Robinson, district horticultural inspector in the Yakima district, recently issued a warning to growers there not to pull up peach trees that they thought had been killed by the freeze. Mr. Robinson says that it will

not be possible to tell the extent of the injury until spring sets in.

A report from Wenatchee is to the effect that claims amounting to \$600,000 to \$1,000,000 for 2,000 to 3,000 carloads of apples said to have been frozen in transit have been presented to the railroad administration from that district alone. The opinion prevails at Wenatchee that these claims will have to be paid if the fruit was shipped under heat in refrigerator cars, but that no damages can be collected for fruit shipped in ordinary box cars.

The aggregate yield of farm and orchard products of the Sunnyside project for 1919, amounted to \$12,678,247, according to the annual report by J. G. Heinz, project manager. In the preceding year the crop return was but \$7,218,392. The project totals 90,000 acres. Prunes gave an average net return of \$613 an acre. The second highest acreage yield is hops, with \$528 per acre. For the first time in the history of the project alfalfa was displaced as the most valuable crop grown. Increased production and high prices placed apples in the lead with a total value of \$4,771,750 for 59,646 tons produced. Hay was second with a value of \$3,955,050.

At the annual meeting of the Peshastin Fruit Growers' association it was decided to build a new cold storage warehouse at Peshastin with a capacity of 300,000 boxes of apples. A hotel and boarding house will also be built to take care of 200 persons whom the association employs each year. The improvements will cost \$100,000.

The lumber required to make boxes for Washington's 1919 apple crop was sufficient to build 9,660 average country homes, each housing a family of five, according to estimates given by the U. S. Reclamation Service in the January issue of the Reclamation Record. The basis for the computation is that five board feet of lumber is required for an average apple box. The reclamation service estimates that the average country home, large enough for a family of five requires 10,000 board feet of lumber. The Bureau of Crop Estimates, U. S. Department of Agriculture, gives the commercial 1919 apple crop of Washington as 19,320,000 boxes.

IDAHO.

Two hundred delegates attended the convention of the Idaho State Horticultural Society recently held at Payette, which proved to be one of the most interesting and valuable meetings ever held by the organization. The program included speakers of note in the fruit growing industry in the northwest as well as from the Idaho State University. The new officers of the society are: President, D. L. Ingard of Payette; vice-president, J. P. Gray of Nampa; treasurer, A. E. Gipson of Caldwell; secretary, I. Lee Truax of Meridian; directors, first district, Professor C. C. Vincent, Moscow; second district, Guy Graham, Fruitland; third district, L. G. Dunn, Bliss; fourth district, J. A. Waters, Twin Falls. Resolutions were adopted by the association commending the action of the state department of agriculture in carrying on such an extensive orchard inspection program.

Experienced Orchardist Wanted

To care for ten-acre apple orchard, ten years old, located near Newberg, Oregon. Would prefer share basis. Good opportunity for the right man.

G. E. S., care of Better Fruit

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Every up-to-date fruit grower knows that bees are indispensable to the best fruit growing. There is no argument about it. Why not begin with the bees this year? We will tell you how. Not hard to learn. Easy to do—but get started right. Small expense to start. You profit doubly in better fruit and a crop of honey. Drop us a card today, asking for our two handsome and valuable booklets entitled "Bees and Fruit" and "Bees for Pleasure and Profit." They are full of every sort of information about bees and beekeeping. Tell us whether you have ever kept bees before.

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B. F. Taussig in the Payette district has built an underground cold storage room that will accommodate 9,000 boxes of apples. The storage apartment is built into the hillside and although filled to capacity during the severe cold weather, Mr. Taussig reports that not an apple was injured and that he estimates that the value of the fruit saved this year will more than pay the cost of construction.

Fruit tonnage from the Lewiston and Clarkston districts in 1920 will be materially less than normal owing to frost damage it is reported. Cherry and peach trees in the Lower Snake River valley are said to have suffered very heavily, while a very light cherry crop is expected in the Lewiston district proper.

The plant of the Oregon Packing company at Lewiston has closed after a record breaking summer and fall. In spite of the fact that last summer was very unfavorable for the growing of tomatoes, the packing plant had a run of 20,000 cases.

What They're Doing in California

It is now predicted that Imperial Valley cantaloupes will go on the market the earliest in history of the melon business and that the crop will be the largest from that section ever known. It is said that one-third of the

cantaloupes consumed in the United States will come from this district this year. The Japanese, who are the heaviest growers in the Imperial Valley are using forcing methods in order to ship the first fruit and avoid a glutted market during the mid-season.

The California Prune and Apricot Growers, Inc., with headquarters at San Jose, is making a strenuous campaign to secure sufficient additional acreage to maintain its control of 75 per cent of the production. The organization announces that failure to get the requisite quota of acreage will compel it to permit its options on members of crops of 1920 and 1921 to lapse. It is believed, however, that this serious situation will be fully met and overcome. The campaign has been endorsed by the San Jose Chamber of Commerce and the Merchants' association.

The northern California orange crop season which has just ended was 15 per cent heavier in production than ever before. Notwithstanding this fact the prices received are reported to have been highly satisfactory. Northern California lemon growers are now making heavy shipments of the fruit which is reported of finer quality than usual.

According to experts, successful culture of pecans on a commercial scale in Fresno county is not problematical. A Riverside firm has also issued a bulletin calling attention to that

section as a natural home of pecan orchards. The market for pecans is good and if there is an abundance of water, there seems to be no reason why they cannot be grown successfully.

Stating that they desire to propagate better fruit trees the nurserymen of California have organized a state-wide organization to carry out this plan. One of the leaders in the movement is George C. Roeding, president of the California Agricultural Society. In setting forth the objects of the organization which has been incorporated the incorporation document says: "The purposes for which this corporation is formed are to improve the grade and character of fruit trees grown in the state, and to increase the production of fruit therein by a selection of bud wood from trees producing record crops and fruit of a superior type, and by the distribution of nursery stock grown from such selected bud wood, and to, as far as possible, cause such superior type of trees to be used by the fruit-growing interests of the state; and for such purposes to experiment in or to produce such superior types; to accomplish the foregoing with the coöperation, as far as possible, of experts connected with the United States Department of Agriculture and the University of California, and any and all other experts whose experience and advice will be of such character as to accomplish the best results."

SERVICE

WATSONVILLE, CALIFORNIA



BULLETIN

SEATTLE

NEW YORK

SUBJECT.

The Time to Winter-Spray Pear, Prune, Apricot, and Apple Trees with Grade "A"

In Spraying with Ortho Crude Oil Emulsion Grade "A," it should be remembered that for the best results, the emulsion should be applied at the proper time. From the experimentation which I have conducted, the best time was determined as being while the trees were dormant, from January 1st to the time of visible bud swelling. We are glad to note that practically all of the purchasers of our emulsions are following, with very pleasing results, our recommendations:

First—Use the emulsion at the proper strength, usually 36 gallons to the 200-gallon tank.

Second—Apply at the proper time: i. e., while the trees are dormant, from January 1st to time of visible bud swelling.

Third—Apply with great thoroughness so as to cover all the twigs and branches perfectly.

The highest possible success for the control of orchard pests, by winter-spraying, will follow the use of our Ortho Crude Oil Emulsion, Grade "A," well applied.

When referring to this bulletin, please give date and subject.

Watsonville, California

Date: January 10, 1920

W. H. VOLCK,

Director of Research.

Cannery Notes

The Umpqua Fruit Growers' association, with headquarters at Roseburg, Oregon, has decided to build and equip a modern cannery in time to take care of the 1920 fruit crop. This action was taken as the result of the successful year the association has had in the marketing of canned goods from their old plant. The new plant will be located in the center of the city of Roseburg along the Southern Pacific railroad tracks. Seventy per cent of the stock of the concern is now owned by farmers near Roseburg and last year it did a business in the neighborhood of \$200,000.

According to an item in Western Advertising Libby-McNeil & Libby has purchased the Hinckley-Beach cannery at Burbank, Calif. This cannery was the first institution of its kind to locate in the San Fernando valley town.

The Hood River Glacier says that the Hood River Canning Co., one of the most unique concerns in the country, in that it aims to pack a product of super-excellent quality, has doubled its capacity. The season's run on strawberries, cherries and pears resulted in a total pack of 193,000 cans. A total of 280,000 cans of the valley's best grade of apples will be packed. The cannery company's payroll for the year's run will approach \$40,000.

An extensive national campaign has been started by the National Cannery association to increase the consumption of canned fruits and foods and to show that the generally accepted idea that canned goods cause ptomaine poisoning is erroneous. National weeklies, women's magazines, agricultural journals, trade papers and medical and hospital magazines will be used in addition to the newspapers. A four year campaign is planned according to a statement in Judicious Advertising and the association will spend \$500,000.

The Puyallup and Sumner Fruit Growers' Canning company of Puyallup, Wash., is to spend \$100,000 during 1920 to advertise "Paul's Jams," named after W. H. Paulhamus, president of the company, who has been so successful in building up the business of this cooperative association. The leading national weeklies and magazines of the country will be used. The business of this concern in 1919 amounted to nearly \$1,000,000 and it is expected that it will be greatly extended this year.

Canning companies operating in the state of Washington are reported to be making contracts for fruit for the coming season.

Owing to the competition of cider making plants and the short apple crop in New York the evaporating plants in that state had one of the shortest seasons in their history. The prices paid for stock for evaporators ran from \$1.75 to \$2.00 per hundred and chops and other waste used in by-products ruled high.

Two million gallons of wine grape juice was put up during the past season by a company in San Joaquin county, Calif. The juice was put into 50 gallon barrels and the barrels were varnished to keep them air tight. The product was shipped east.

The Buhl Canning company, an Idaho concern, announces that it will furnish hot beds for the germination of tomato plants this spring. This step is expected to greatly expedite transplanting and insure an early crop of tomatoes for canning.

Work has commenced on the cannery to be constructed at Gridley, Calif. Because of the lack of housing accommodations, a large dining room and dormitory will first be built. The first unit of the cannery will be complete about June first. A survey has been made of the prune orchards and it has been decided to erect a packing house at Gridley.

The United States has built up an increasingly large trade in dried fruits with Australasia, especially with New Zealand, where the

exports from the United States have increased from 3,325,214 pounds in 1914 to 9,205,028 in 1918, or 177 per cent. A table in a recent report on foreign markets made by the Bureau of Markets of the U. S. Department of Agriculture shows that raisins are the largest item in this total, prunes second and apricots third.

Canneries are contracting for next year's asparagus crop in the Sacramento river delta section at from six to eight cents a pound. Last season the price ranged from three to six cents. The asparagus-growing acreage has increased in a phenomenal manner during the past few years in this section, and now totals over 12,000 acres.

Bits About Fruit, Fruitmen and Fruit Growing

Under a bill recently introduced at the special session of the Oregon legislature, all persons and companies engaged in the packing or canning of fruits in Oregon would be made liable to a fine of \$25 to \$100 unless all containers holding fruits or vegetables grown in the state are labelled designating them as Oregon products.

Leroy Childs of the Hood River Agricultural Experiment station recently made an address before the annual meeting of the American Entomological Society held at St. Louis. The subject selected by Mr. Childs was "The Control of Codling Moth, With the Spray Gun, the Spray Rod and Dusting."

The horticultural department of the Oregon Agricultural Department will experiment with a freak apple shaped like a banana that has been produced at Oregon City. The tree which grew the fruit was purchased several years ago as a Gravenstein. This year three bushels of apples were harvested from it, few of which had seeds.

Ciders and fruit juices which are allowed to have more than one-half of one per cent of alcohol will come under the ban of the constitutional prohibition act according to a recent announcement of Prohibition Commissioner Kraemer.

Frosted box apples on the eastern market which have been selling for \$1.25 to \$2.00 per box according to their condition have very materially hurt the sale of sound fruit according to reports from New York. Up to the middle of January over 8,000 more cars of northwest apples had been shipped to the Atlantic coast than at the same time last year. It is estimated that there are more than 5,000 more cars of apples in storage on the Pacific coast at this time than there were last year.

Of a total of 58,651 cars of apples shipped in the United States up to December 1, the northwest had shipped 20,759 cars.

A large delegation of fruitmen from the east were in attendance at the recent meeting of the Western Fruit Jobbers' association which met in San Francisco.

The possibility of using logged-off lands for the planting of berries is receiving a great

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deal of attention from those who contemplate going into this industry on a big scale. The fact that the land can be utilized for this purpose in many instances without removing the stumps until such time as an income is provided is making this kind of fruit raising attractive. It is believed that thousands of acres of logged-off lands in Oregon and Washington will be utilized in this way in the near future.

The rumor that the English government's price control of apples had been removed recently was very emphatically denied by Dwight Woodruff, New York representative of the Hood River Apple Growers' association. To substantiate his statement Mr. Woodruff published a cable message from London which said that the price control act was still in effect. Inasmuch as there is a large quantity of Canadian and Nova Scotia barreled apples yet to be marketed abroad and they can be sold at a profit for less money than American box apples it is doubtful if the English government, which is apparently favoring the

sale of fruit from the home country and its provinces will allow any raise in apple prices this year. In April and May the apple crop from the Australia and New Zealand sections will be ready for shipment so that the British market for apples from the United States this year is liable to continue weak and uncertain.

California's fruit crop in 1919 totalled approximately \$50,000,000 in value, according to an estimate made by Charles E. Virden, president of the California Fruit Distributors.

FOR SALE

Thirty-acre 8-year-old irrigated apple orchard, well taken care of, plenty of water and in fine condition. Located in Southern Idaho in one of the best apple growing districts in the country. Good climate, beautiful country, big crops, high prices and a fine opportunity for anyone interested in securing a bearing orchard of the best varieties of apples. Address Dept. L, Better Fruit.

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Never in the history of commercial fertilizers has
NITRATE OF SODA

been so universally accepted as a revenue producing investment as this year. From the Peanut producing sections of the Southwest to the Fruit sections of the Northwest, farmers are not asking "What Fertilizer?" but "How Much Nitrate?" with the result its use in the United States this year will be nearer to the volumes imported by Japan and European countries where intensive farming is a necessity.

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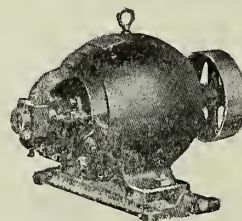
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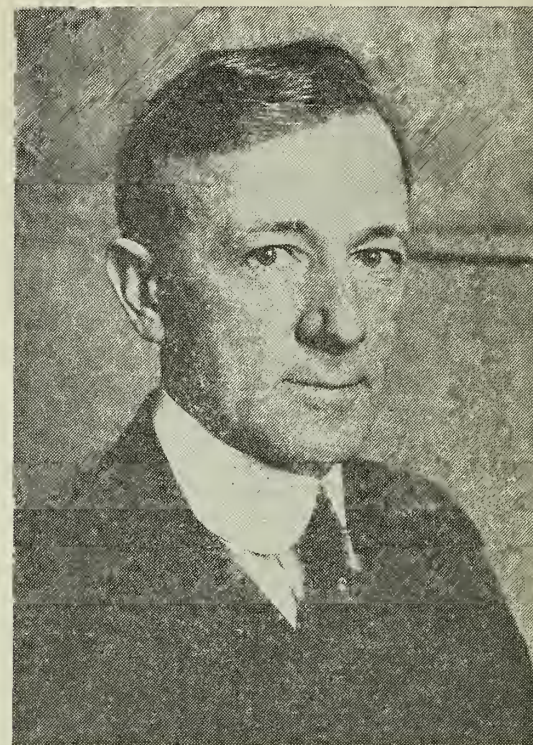
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Some territory still open for live dealers



Northwest Fruit Industry Loses Able Friend



ARTHUR RUPERT

President of the A. Rupert Company, Inc.,
who recently died.

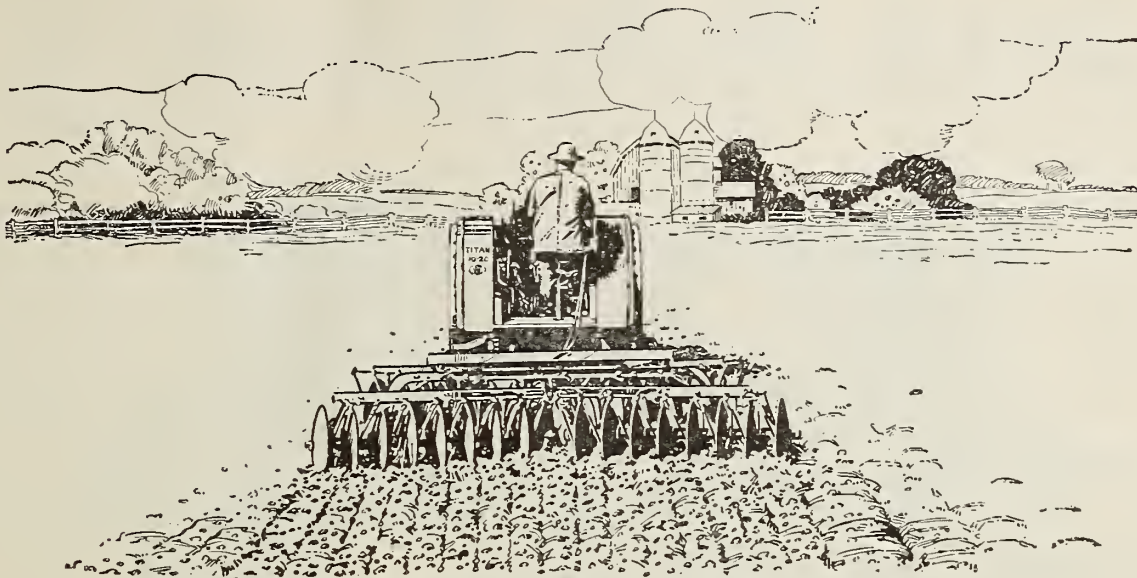
Although the fruit industry of the Northwest lost one of its foremost advocates in the death of Arthur Rupert, president of A. Rupert Company, Inc., still the big work he had undertaken for the development of the industry and the expansion of his canning activities will continue.

This was assured by the action of the directors at a meeting immediately after his death in January when they unanimously voted to follow his policies of coöperation with the growers and also authorized the expenditure of \$150,000 for betterments of the plants and extensions this year.

The company owns fruit canning plants at Newberg, Falls, City, Springbrook and Lebanon, Oregon, and he has just taken over another big plant at North Puyallup, Washington. It is also building a new one at McMinnville, Oregon. The capacity of the plants this year was 625,000 cases of canned fruit.

The company has distributing branches in the principal cities of America and also sells heavily in Europe through its London and Paris branches.

Mr. Rupert was one of the West's most successful canners and was considered an authority on the industry. He believed that growers and canners had, in the development of the industry, a mutual interest and that the prosperity of one depended on the other. For this reason he gave much of his time to the creation of a service for growers, with the object of assisting them in the selection of suitable lands, and plants for the production of the best fruits. He also made the canneries the meeting place for growers and provided lecturers for such gatherings. He was 44 years of age and is survived by his widow and three children.



Help Mother Nature

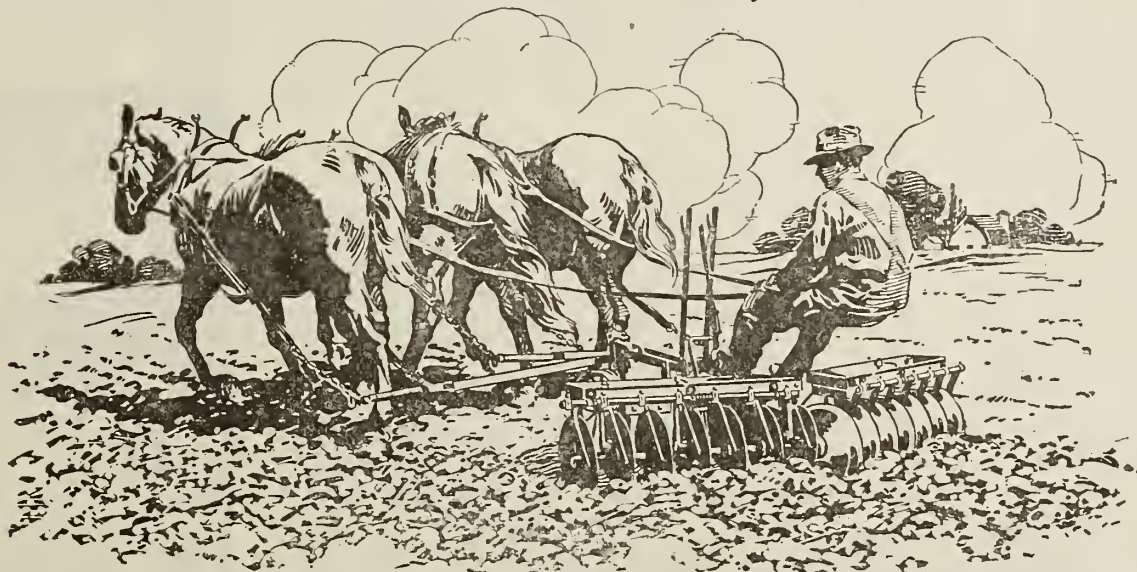
NATURE does her share in seed bed building by providing fertile soil, moisture, and healthy seed. There Nature's obligation ends. The rest is up to you.

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A seed bed prepared with **International Tillage Tools** — disk harrows, spring and peg-tooth harrows, combination harrows

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Observations on Treatment of Winter-Injured Trees

Continued from page 16.

is not so much a problem of available plant food in the soil so much as it is a question of the tree's ability to make use of it.

"I believe it best for the grower not to prune young trees until winter is definitely over and no further danger of hard freezes is probable. Considerable evaporation takes place from the cut surfaces, which can, to a large extent, be curtailed by leaving the tree alone. The grower will readily recognize that the cut surfaces of the injured wood will more readily dry out and die back than is true of healthy tissue because of the former's inability to supply the moisture as fast as it is carried away. In some cases I believe it well for the grower to wait a few days after the

growing season starts before pruning, as then one will have a more definite idea whether the injured wood is going to grow or not. However, if growth does not start promptly within a week or ten days after the normal season, pruning should be done promptly.

"Trees which have been injured quite badly should be pruned heavily, the idea being to concentrate the sap to a smaller area and thus strengthen those parts. This will apply equally to trees in bearing or not in bearing."

Injury to Peach Trees.

In the pruning treatment of winter-injured peach trees we find that experiments made by A. J. Gunderson, Associate in Horticulture of the University of Illinois Agricultural Experiment Station, apparently demonstrated that moderately heavy pruning was the most beneficial. These experiments were made in the summer of 1918 as the result of prolonged periods of very cold weather in peach orchards in Southern Illinois, in the winter of 1917-18, when the temperatures reached as low as 20 to 25 degrees below zero.

In recording the results of these experiments Mr. Gunderson in his bulletin remarks:

"During the periods of low temperature strong winds prevailed. Fortunately, however, there was a good covering of snow in most peach orchards, and therefore the injury was confined to the trunks and the branches of the trees. Peach growers were at a loss to know how their trees should be treated, especially with reference to pruning. Some were pruning their trees severely, while others were pruning moderately. The writer recommended moderate pruning for both old and young peach trees, as experimental evidence had indicated that for winter-injured peach trees more than one year old moderate pruning was better than severe pruning. In the case of June-budded or small yearling trees planted during the fall of 1917, however, it was recommended that the usual cutting back to whips be practiced.

"Winter injury to peach trees in Illinois during the winter of 1917-18 including the killing of the fruit buds and injury to wood of different ages, varying from a slight injury to the tissues to severe injury and subsequent death of the trees. In most cases trees which had been planted but one year showed less injury than older trees. The internal symptoms of winter injury appeared in the form of discoloration of the heartwood and sapwood, varying in color from light to dark brown. The cambium layer turned a pale, watery green. The odor of the cell sap was sour, suggesting fermentation. These conditions were present in the trunk and the branches. The roots of the trees in every peach orchard examined remained normal, owing to the protection afforded by the heavy covering of snow.

"The first external symptoms of winter-injury appeared in the form of shrunken bark on which the lenticles stood out prominently, giving the bark a slightly roughened appearance; and

also in some cracking or splitting of the tree trunks. A later symptom was noted in which the leaf buds expanded, owing to the local supply of stored food, but finally wilted on account of the inability of the injured tissues to conduct sap from the roots. This type of injury appeared both on single branches and on entire trees.

"The amount of winter-injury to peach orchards in southern Illinois varied not so much with latitude, for the low temperatures were quite uniform, as with differences in vigor and healthiness of the trees, elevation of the orchard, and age of the trees. Trees devitalized as the result of previous injury from borers, gummosis, and lack of proper feeding and cultivation were most severely injured and in many cases died. Those located on well elevated and properly drained soil showed less serious injury than those situated on level land or in 'pockets.' In some cases a difference of a few feet in elevation within the same orchard caused a marked difference in the severity of the injury. Trees which had been planted one year appeared to be injured less than older ones.

"Little opportunity was afforded to study winter injury on any variety of peach trees other than Elberta and Hale. The former variety is the most important one grown commercially in southern Illinois, while the latter is being planted to some extent. It has been thought by certain peach growers of other states that Hale is more resistant to low temperatures in the bud than is Elberta, but in southern Illinois during the winter of 1917-18, both varieties proved failures in this particular. Hale is a less thrifty grower than is Elberta in this section of the state and following the winter of 1917-18 showed as much, and in certain cases more, serious wood injury.

"As serious winter-injury to the wood of peach trees rarely occurs in south-

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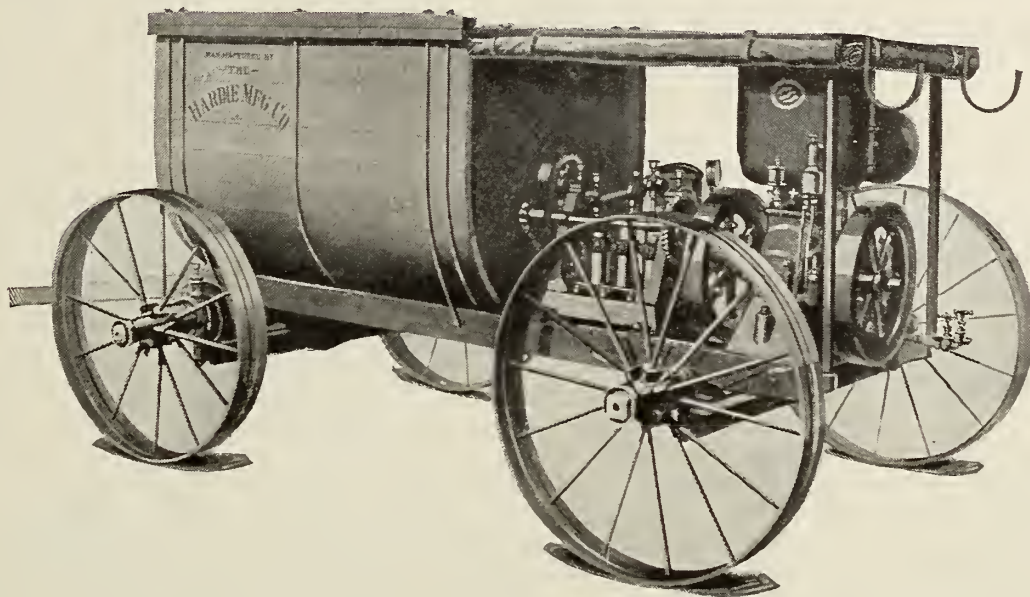
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Depending not on one feature alone, nor adaptable to only one class of growers, this machine will fit any orchard condition and meet any spraying problem.

Combined in this one machine is the ample capacity for rapid work, the uniform high-pressure which insures effectiveness, the under-slung truck enabling operation under adverse orchard conditions; plus a sturdiness that enables it to stand the strain of hard service for years.

*It is first, last, and all the time your most powerful weapon
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If you desire low operating costs, high speed work, and above all, the satisfaction of a clean, high-quality fruit crop

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Portland, Oregon

ern Illinois, advantage was taken of the opportunity offered at this time to conduct investigations with the view of determining a satisfactory way of handling such trees. Experimental work was confined to the Elberta variety."

Results of Experiments.

In the spring of 1918 three sets of pruning experiments were started on different plots of the injured trees, the pruning being done from March 26th to March 28th, when the leaf buds had started. The methods of pruning were as follows:

Row 1. Pruned moderately; previous year's growth clipped approximately one-half.

Row 2. Dehorned, the one and two-year-old wood removed.

Row 3. One-year-old wood removed.

Row 4. Check. Unpruned.

On April 1, Mr. Gunderson notes that one pound of nitrate of soda was applied broadcast to three of the trees in each row for the purpose of studying

the effects of fertilizer on the recovery of fruit trees from winter-injury. The trees were examined frequently during the spring and summer and the fact is noted that the foliage of the trees which had received the nitrate of soda was heavier and of a darker green color than that of the untreated trees. "This difference," the writer says, "was much more apparent however in the check and the moderately pruned trees than in those dehorned. This was probably due to the fact that the heavy pruning of peach trees usually results of itself in the stimulation of heavy wood growth and foliage, especially when the trees are in vigorous condition."

On October 30, Mr. Gunderson made an examination in regard to these experiments which he records as follows:

"Observations were made October 30 on the relative amount of fruit-bud formation on the trees in the different rows. The trees in Row 1, whose one-year-old wood had been clipped, carried the largest number of well distributed, vigorous fruit buds and on wood of desirable size. The unpruned trees carried a large number of less plump but well distributed fruit buds on small-sized branches. The trees in Row 3, from which the one-year-old wood had been removed entirely, had a good many poorly distributed fruit buds carried on wood that was a little too heavy to be desirable. The tops of the trees in this row were so dense as to require considerable thinning of the branches and consequent removal of many fruit buds.

"Very few fruit buds were present on the dehorned trees in Rows 2 and 4. This was due to the fact that, as usual on severely pruned trees, long and heavy primary growth of branches developed, on which relatively few fruit buds ever appear.

"Examination of the internal tissues of the wood of both branches and trunks was made in the experimental orchards during November after the growing season had ended. It was observed that a new layer of sapwood had been formed of greater thickness in the trunks of the trees than in the branches. The heartwood and pith had assumed a 'punky' condition, suggesting decomposition. Whether such a condition will eventually prove detrimental to the productiveness and vigor of the trees remains to be seen."

Vigilance Necessary.

In view of the fact that extensive winter injury to fruit trees in the Pacific Northwest has heretofore been limited the experiments of the Illinois Experiment Station are both interesting and valuable and lead, as Mr. Brown says in summing up his conclusions to the belief that the situation is hopeful.

The proper method for growers in the Northwest who have injured trees is to investigate their orchards carefully from now on, keep in touch with the agricultural experiment stations and adopt those methods which will result in the minimum loss in both fruit and trees.

G. L. Davenport

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APRICOT—Superb

Other varieties of peach and limited quantities of other varieties of apple.

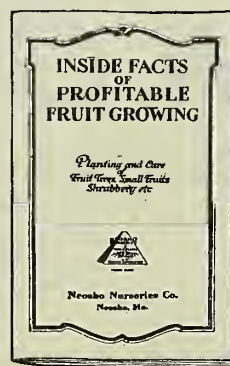
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APPLE—	Caliper	Each Rate	5 Rate	25 Rate	50 Rate	100 Rate
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	7/16 to 9/1665	.55	.50	.45	.40
	9/16 up75	.65	.60	.55	.50
2-yr.	1/2 to 5/865	.55	.50	.45	.40
	5/8 to 11/1675	.65	.60	.55	.50
	11/16 .....	.85	.75	.70	.65	.60
	* 3/4 up .....	.95	.85	.80	.75	.70
	* (This size in Baldwin only.)					
PEACH—	Under 5/16 .....	.65	.55	.50	.45	.40
	5/16 to 7/16 .....	.70	.60	.55	.50	.45
	7/16 to 9/16 .....	.75	.65	.60	.55	.50
	9/16 to 11/16 .....	.80	.70	.65	.60	.55
	11/16 up .....	.85	.75	.70	.65	.60
PLUM—	Under 5/16 .....	.70	.60	.55	.50	.45
	5/16 to 7/16 .....	.75	.65	.60	.55	.50
	7/16 to 9/16 .....	.80	.70	.65	.60	.55
	9/16 to 11/16 .....	.90	.80	.75	.70	.65
	11/16 up	1.00	.90	.85	.80	.75
APRICOT—	Under 5/16 .....	.70	.60	.55	.50	.45
	5/16 to 7/16 .....	.75	.65	.60	.55	.50
	7/16 to 9/16 .....	.80	.70	.65	.60	.55
	9/16 up .....	.85	.75	.70	.65	.60



Our catalog, "Better Fruit Trees," mailed free on request. Every customer also receives free of charge our 80-page illustrated book, "Inside Facts of Profitable Fruit Growing," which experts and beginners too say is "A Wonderful Help to Fruit Growers." (Price 10 cents to others.)

NEOSHO NURSERIES CO.
2 Lake Street
Neosho, Missouri



Methods of Orchard Heaters

Continued from page 11.

changed condition. The regulated type of heater thus provides many advantages over the crude styles of smudge pots which were formerly on the market.

It is of much importance to carry on the heating work if frosts appear any time during the swelling of the buds up until the time the fruit has reached the size of marbles, for unless the crop is protected at this later period of growth, the tender little stems will freeze and large quantities of fruit will fall to the ground. It must not be lost sight of that unless a heater of at least three or four gallons capacity is used, the work involved of refilling is large and in commercial orchards the growers demand the larger sizes.

In concluding these remarks to the commercial fruitgrower—to safeguard his crop it may be mentioned that man has devised irrigation to offset drouth, insurance to offset fire and orchard heaters to eliminate frost. The protection is at every grower's command, but the work must be prosecuted intelligently and thoroughly if he expects to secure a high degree of success and a bumper crop each succeeding year.

The white arsenic produced in the United States in 1918 amounted to 6,323 short tons, valued at \$1,213,000. By far the greater part of the domestic white arsenic consumed in the United States in 1918 was used in preparing insecticides and weed killers, the total quantity so used in 1918 being about 2,000,000 pounds, according to the United States Geological Survey.

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Portland, Oregon

Combined Bordeaux Oil Spray

Continued from page 9.

6-6-50. It is necessary that the Bordeaux solution be neutral and not alkaline as Bordeaux is ordinarily made. This is determined by adding the lime milk slowly allowing the lime milk and copper solution to be well mixed and testing with blue or red litmus paper to determine when the neutral point is reached.

If no rain follows the application of Bordeaux oil emulsion spray for 24 hours, the spray dries thoroughly and stays on the bark of the trees throughout the season, and is effective against anthracnose development after the fall rains begin.

Prof. W. S. Thornber to Enter New Field

The announcement is made that Prof. W. S. Thornber, who, for many years was director of the agricultural extension service at Washington State College, will take up the work of consulting horticulturist in the northwest as a profession. It is Prof. Thornber's intention to cover the entire northwest territory in this capacity, going to any section where there is a demand for his services although his headquarters will be established at Lewiston, Idaho.

A study of the situation has convinced Prof. Thornber and others who are in touch with the fruit industry of the northwest that there is a wide field for this character of work notwithstanding the excellent service being rendered by the government and state institutions. It is not necessary to say a great deal in regard to Prof. Thornber's special fitness for the work he is about to take up. He has grown up with the great agricultural development that has taken place in the northwest and has had an experience and an opportunity to become informed on the various branches of agriculture and horticulture such as is presented to few men in the profession, in addition to his thorough technical training. Added to this is the fact that he has a natural liking for the work which leads him to an investigation of the most unimportant problems connected with it as well as those of a more serious and important nature. Along with all this he is practical in the application of his ideas which forms the basis of all real help to the fruit grower.

In entering this new field Prof. Thornber will undoubtedly find a demand for his aid and will render a service that will be of great help to the fruit growing industry of the northwest.

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to rent or lease, an improved orchard farm by party having both practical experience and technical training. Best of references furnished.

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Peach Nursery Stock Short.

Mr. Frederick Maskew, chief deputy quarantine officer of California, advises that all indications at the present time point to a shortage of peach nursery stock for planting during the coming season. In view of this fact, it will be good policy for all state quarantine guardians to secure an approximate

knowledge of the area expected to be planted to peaches in their respective counties this winter, and interview the prospective planters as to the source from which they intend to obtain the nursery stock, at the same time explaining to all concerned the insidious nature of the disease known as "peach yellows."



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OUR CATALOG FOR 1920

tells all about it and our other Fruits and Berries, Garden, Farm and Field Seeds, Poultry Supplies, Sprays and Sprayers, Tools, etc. Mention "Better Fruit" when you write, and receive our 1920 calendar as well as our new catalog.

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BETTER FRUIT PUBLISHING COMPANY

OREGONIAN BUILDING, PORTLAND, OREGON

Fruit Insect Control

Continued from page 6.

market or cooking purposes, the infestation being discovered first when the maggots which have deserted the fruit are found on the bottom of the container. The adult flies feed more or less before egg laying and, it is stated, can be killed if the foliage is kept covered with a poison spray. A good spray for this purpose is arsenate of lead paste 2½ pounds (or 1½ pounds of the powder), cheap molasses 1½ gallons, and water to make 50 gallons. The first application should be given in early June and occasionally repeated during the succeeding three or four weeks, depending upon the rains. Some cherry growers report that it is unnecessary to sweeten the spray.

Cherry leaf-beetle—The cherry leaf-beetle occurs sometimes in enormous numbers in the northern and more eastern states, attacking the foliage and fruit of the cherry, and to a less extent the foliage of the peach. A careful lookout should be kept for the beetles, and upon their first appearance trees should be sprayed with arsenate of lead at the rate of 5 pounds of the paste (or 2½ pounds of the powder) to 50 gallons of water. The addition of 1½ gallons of molasses to the spray is said to increase its effectiveness.

PLUM INSECTS.

Several of the insects injurious to the peach, already considered, attack also the plum, as the San Jose scale, the terrapin and other lecanium scales, the plum curculio, the peach borer, etc. See "spraying schedule" for control of plum curculio and brown-rot.

Plum aphids—Three species of plant-lice are common on plums and often require treatment. These winter on the trees in the egg stage, the aphids hatching in the spring about the time the buds are breaking, and later may become very numerous. In localities where injury is

usual each year trees should be sprayed as the buds are breaking, as described for apple aphids. Otherwise it will be sufficient to spray when the aphids are actually troublesome, using 40 per cent nicotine sulphate, three-fourths of a pint to 100 gallons of soapy water, or in the self-boiled lime-sulphur mixture and arsenate of lead spray described in the spraying schedule.

GRAPE INSECTS.

CONTROLLED BY SUMMER SPRAYING.

Grape-berry moth—In late summer grape berries are often found infested by an active, greenish caterpillar about three-eighths of an inch long, the larvæ of the grape-berry moth. It is at present destructive in northern Ohio and to a less extent in portions of the Chautauqua and Erie grape belts. First-brood larvæ feed on the blossom or young fruit clusters, and those of the second brood injure the green and ripening berries, often so soiling the bunches that they must be carefully picked over by hand before marketing. The insect is well controlled by an arsenate of lead spray of 3 pounds of paste (or 1½ pounds of powder) to 50 gallons of Bordeaux mixture, applied by the "trailer" method just after the blossoms have fallen, and again two weeks later.

Grape rootworm—The presence of the grape rootworm in vineyards is shown by chain-like feeding marks of the adult beetles on the foliage. The larvæ consume the fibrous roots of the grape and cut out furrows in the larger roots, stunting the growth of the vine, so that the foliage becomes yellowish, and the fruit may shrivel and fall. It is a serious pest in the Erie-Chautauqua and northern Ohio grape districts and requires annual treatments to keep it reduced below injurious numbers. Since the beetles feed on the leaves during early summer and before egg laying to any extent, they may be controlled by the use of arsenical sprays applied in Bordeaux mixture, as for the berry moth, as described in the spraying schedule.

Grape leafhopper—The grape leafhopper is a small, agile, whitish insect, with red and yellow markings, often noted as abundant during summer on the lower surface of grape leaves. It feeds by sucking juices from the leaves, and its punctures cause the foliage to become blotched with white and later to turn brown, and many of the leaves fall from the vines. This injury interferes with the proper ripening of the fruit and prevents normal vine growth. The insect is a pest of much importance on American varieties of grapes throughout the country, generally, and especially in the Great Lakes district, and also on vinifera varieties in some regions of the west. It is controlled by the use of one-fourth pint of 40 per cent nicotine sulphate to 50 gallons of soapy water or Bordeaux mixture. The first application should be made when the wingless hoppers or nymphs of the first brood are present in large numbers (in the north this will be in late June or early July), as can be determined by examination. The nicotine should be used in the arsenate of lead and Bordeaux mixture spray, described in the spraying schedule, and the "trailer" method of application followed. Much care is necessary in spraying to hit the insects on the lower surface of the leaves.

Rose-chaffer—In some sections of the country the long-legged, yellowish-brown beetles, about one-half inch long, known as rose-chafers, often put in appearance in large numbers about the time of blossoming of the grape, roses, and many other garden flowers, stripping the plants of blossoms and foliage. They feed upon a large variety of plants, and when very abundant do much damage in spite of treatment. Thorough spraying upon first appearance of the beetles is recommended, using arsenate of lead, 5 pounds of the paste (or 2½ pounds of the powder) for each 50 gallons of water, repeating the application as necessary to keep the plants coated with poison. Hand picking of beetles in the early morning may be practiced on a small scale, and bagging choice plants with mosquito netting also may be resorted to.

Grape leaf-folder—Grape leaves are often rolled or folded over by an active, grass-green caterpillar about three-fourths of an inch long, the so-called grape leaf-folder. Within the folded leaf the larvæ eat out the soft leaf substance, and when numerous may cause more or less defoliation of the vines. The larvæ of the first brood appear on the vines in early summer. Well-sprayed vineyards are not seriously troubled by the leaf-folder, and its injuries are usually confined to the home vineyard. Spraying the vines with arsenate of lead when the larvæ are first in evidence will keep them in check. Hand picking of infested leaves or crushing the larvæ in the folded leaves is practicable where only a few vines are involved.

Eight-spotted forester—The caterpillar of the moth known as the eight-spotted forester feeds on grape foliage and is sometimes much complained of locally. The full grown caterpillar is about 1½ inches long with transverse black and orange stripes or bands, and there is a distinct hump near the hind end. Larvæ are present on the vines from early June until about August. They may be controlled by the use of arsenate of lead, as described for the grape leaf-folder.

Grapevine flea-beetle—A small, steely blue beetle often attacks the swelling buds of the grape in the spring. The larvæ of the beetles later feed upon the foliage. Where injury by this pest, known as the grapevine flea-beetle, has been prevalent or is to be expected, vines should be sprayed, as the buds are swelling, with arsenate of lead—3 pounds of paste or 1½ pounds of powder to 50 gallons of water or fungicide. This insect usually is kept in check by the arsenate of lead used in the first and second applications. This destroys the larvæ.

GRAPE SPRAYING SCHEDULE.

First application—About a week before the blossoms have opened, or when the shoots have become 12 to 18 inches long, spray with Bordeaux mixture 4-4-50 for fungous diseases, adding 2 to 3 pounds of arsenate of lead paste, or one-half that quantity of the powdered form, for the flea-beetle, the rose-chaffer, etc.

Second application—Just after the blossoms have fallen spray with the same materials as in the first application for the same fungous diseases and insects and for the grape-berry moth, grape leaf-folder, and adults of the grape rootworm, by the "trailer" method.

Third application—About two weeks later use Bordeaux mixture 4-4-50, arsenate of lead paste 2 to 3 pounds, 40 per cent nicotine sulphate ¼ pint, to 50 gallons of spray mixture, for fungous diseases, berry moth, eight-spotted forester, grape leaf-folder, grapevine aphid, grape rootworm, and grape leafhopper. To destroy the leafhopper, direct the spray against the lower surface of the leaves. To control the berry moth, thoroughly coat the grape bunches with the spray by the "trailer" method.

Fourth application—About ten days later, or when the fruit is nearly grown, if black-rot or mildew are still appearing, spray with neutral copper sulphate or verdigris (acetate of copper) at the rate of 1 pound to 50 gallons of water.

CURRANT AND GOOSEBERRY INSECTS.

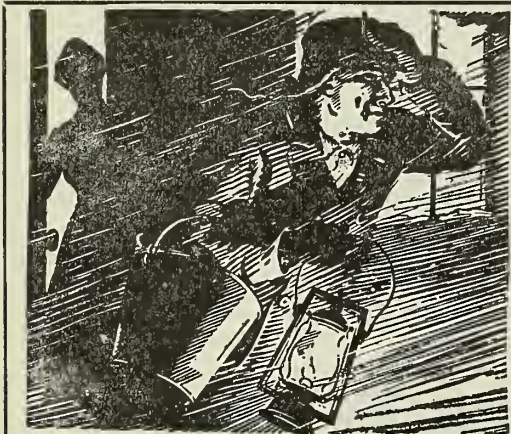
CONTROLLED BY WINTER OR DORMANT SPRAYING.

The San Jose and certain related scales are frequently present in injurious numbers on currant and gooseberry plants, the first mentioned especially often requiring treatment. Winter strength lime-sulphur solution is effective and should be used as directed for the control of this insect on fruit trees as already given.

CONTROLLED BY SUMMER SPRAYING.

Imported currant worm—The imported currant worm when full grown is about three-fourths of an inch long, uniformly green, but yellowish at the ends. Young larvæ are covered with black spots and the head is black. They attack both currants and gooseberries, appearing on the plants shortly after the leaves are out in the spring, feeding at first in colonies but later scattering over the plants. Currant worms are voracious feeders and quickly strip the plants of foliage, hence treatment should be given promptly upon their discovery. Another brood of larvæ appears in early summer, and some seasons there may be a partial third brood. These insects are destroyed readily with an arsenical, sprayed or dusted over the plants. Effort should be made to destroy the first brood and prevent later injury. In treating the second brood when the fruit is ripening, powdered hellebore should be used, diluted 5 to 10 times with flour or air-slaked lime, or as a spray, 1 ounce to 1 gallon of water.

Currant aphid—The currant aphid curls the terminal leaves of the currant and gooseberry, especially the red currant, its presence resulting in little pits or pockets on the lower leaf surface. A reddish color usually develops on the upper surface of injured leaves, which is visible some distance away. This aphid is easily controlled by spraying the plants as the leaf-buds are opening in the spring, thus destroying the young stem-mothers. The 40 per cent nicotine sulphate-soap spray should be used, or kerosene emulsion or fish-oil soap wash. In spraying later in the season the liquid should be directed against the insects on the lower surface of the leaves.



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RHEUMATIC Twinges, Sore Muscles, Stiff Joints, and all other external aches and pains—are quickly relieved by an easily-made application of Sloan's Liniment. Put in on, *don't rub*, for it penetrates and scatters the congestion, and soon a soothing, comforting, warm relief comes to the afflicted part.

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In earliness, productiveness, size, shape, color, flavor, solidity and all desirable qualities it is par excellence. Will stand ahead of all in popularity when better known for both home and market use.

Order early as stock is very limited and sold in packets only. Packet of 100 seeds, 20 cents; 3 for 50 cents; 7 for \$1.00.

Catalogue of other sterling novelties and specialties, Free.

ISAAC F. TILLINGHAST

Seed and Plant Grower

SANTA ROSA, CALIF.

Returns with Valuable Data About Pear Blight

THE seriousness of fire blight which threatens the pear industry of Oregon and which has already wiped it out in certain sections of the country and how the Southern Oregon branch experiment station hopes to be of service through the propagation of blight resistant varieties, was told by Prof. F. C. Reimer, superintendent of the stations during Farmer's week at the Oregon Agricultural College. Prof. Reimer has just returned from his second trip to China for the purpose of obtaining pears which are blight immune. He brought home between 40 and 50 new varieties, and these will be tested at the station next spring and summer.

Prof. Reimer told of oriental customs which were not altogether to his liking. "Chinese hotels," he said, "should be called Chinese hovels. Donkeys, goats, pigs, chickens, and all the vermin God ever made are there. There is no bed, no bedding and no stove. It is a real experience to spend a few nights in one of these places.

"Fifteen to 30 Chinese all sleep in the same room. The Chinese are kicking each other all night long and they snore like a rhinoceros. The noise of the donkeys in another part of the inn is terrific, but when I was given the choice

of sleeping next to the Chinese or the donkeys, I chose the donkeys.

"It is a common experience to find a hog in your room rooting in your baggage. One must carry his own cot, bedding and food. The Chinese inn is beyond description."

Prof. Reimer returns with what is undoubtedly the most complete collection of oriental pears in the world. He has also found several species which are practically immune from blight, and by using this type for the root and branch structure, and grafting with the more edible Bartlett, Bosc, or Anjou, it is believed that a pear will be evolved which will not be affected by blight. Professor Reimer is also interested in creating a new species of pear tree entirely by a process of cross fertilization, using the Chinese and American varieties, which would produce a commercial pear, suitable for the table and free from blight infection.

Prof. Reimer's experiments and discoveries are of far reaching importance, pear growers in all parts of the country being intensely interested in them. In the near future Prof. Reimer will give a lecture on his experiences in China and the result of his research work to date.



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Builders of Sealers and Steam Pressure Canning Outfits

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This class of tobacco gives a man a lot more satisfaction than he ever gets out of ordinary tobacco.

Smaller chew—the good taste lasts and lasts.

You don't need a fresh chew so often. Any man who uses the Real Tobacco Chew will tell you that.



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RIGHT CUT is a short-cut tobacco

W-B CUT is a long fine-cut tobacco

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Knowledge Experience Demonstration

THOSE three words sum up the whole story of Orchard Brand Dry Powdered Arsenate of Lead. What it will do to protect your fruit trees has been proved by discerning growers in the most productive orchard districts.

It prevents injury by codling moth and other insects that obtain their food by eating the fruit.

It also is used to prevent injury to foliage of fruit trees and other plants by chewing insects.

Orchard Brand Dry Powdered Arsenate of Lead is very finely divided. It mixes readily with water. In the spray tank it remains in good suspension. When properly applied by spreading evenly over the surface of the fruit and foliage, it does not collect in splotches. It gives the greatest possible protection.

After years of work and research by experienced chemists and investigators, and carefully executed field tests, Orchard Brand Dry Powdered Arsenate of Lead is recommended as the nearest perfect tree spray material.

Practical fruit growers and experienced entomologists have demonstrated its qualities as reliable and effective. It is in convenient form to handle; uniform mechanically; of high concentration; good spreading ability; adhesive and lasting; and produces satisfactory results under all conditions.

Made in California. Ready for immediate shipment in 200-lb. and 100-lb. drums, 50-lb. and 25-lb. packages, 4-lb. and 1-lb. cartons. Every package net weight.

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General Chemical Company

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San Francisco, California

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PROFESSOR W. S. THORNBUR

Formerly

HEAD OF THE DEPARTMENT OF HORTICULTURE
AND LANDSCAPE GARDENING

Later

DIRECTOR OF THE EXTENSION SERVICE
OF THE
STATE COLLEGE OF WASHINGTON

WILL ADVISE with fruit-growers upon all horticultural problems, including selection and preparation of orchard lands; propagation and care of nursery stock; planting and care of young orchards and small fruit plantations; the control of codling moth, San Jose scale, blight and other orchard pests; the preparation of lime-sulphur at home and the mixing of other sprays; economical orchard management; the irrigation and fertilization of orchard lands; the use of cover-crops and grass mulches; the pruning of fruit trees, shade trees, shrubs, bushes and vines; the renovation of old or neglected orchards, top-working or replacing of poor or unprofitable trees, and the examining and the working out of practical management plans for large orchards and orchard companies.

If your orchard has not been a financial success, and you wish to determine its possibilities or you wish to improve your orchard, reduce your losses and increase your returns I will assist you in working out your problem.

WRITE FOR TERMS

W. S. THORNBUR
LEWISTON, IDAHO

The British Fruit Market

By Edward A. Foley

American Trade Commissioner at London

London—During the past week there has been but little change in the apple situation. British fruit is being absorbed gradually, and American fruit has begun to appear in quantities in the better class of shops.

Liverpool—There is considerable complaint about the bad condition of Virginia fruit.

Bristol—Apples of the best quality are in good demand.

Manchester—The Manchester market was quite bare of American fruit this week, though an arrival on Friday promised a big market for the coming week. There were, however, fair stocks in the hands of retailers selling at the maximum price.

Glasgow—There were fair supplies of American apples on hand, but the delay in unloading, owing to the port congestion, often was responsible for the marketing of apples in bad condition. American and Canadian apples in first-class condition brought maximum prices, but those out of condition resulted in heavy losses. There is a glut of English apples, bringing from 10 to 18s, per cwt. of 112 lbs. (\$2.02 to \$3.64.)

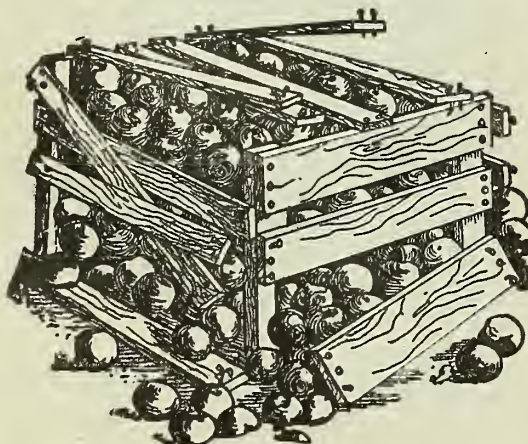
Walnut Production in North China

By Consul General P. S. Heintzleman
Tientsin, October 1, 1919

According to reports received at Tientsin, the market in America for North China walnuts is declining. This trade is conducted between Shanghai and the United States and the prices for shelled walnuts are 16½, 17 to 17½ cents gold per pound, c.i.f. San Francisco. The last offer of 16 cents was refused by firms in the United States, and merchants in Shanghai are warned that the American market is declining.

The many large orders which have been placed in the local market have affected prices in the interior by causing an average increase of about \$2 per picul of 133½ pounds. Walnuts, to be acceptable to the American market, must be white and between 1½ and 1¾ inches in diameter.

The crop for 1919 is good, but the sizes are rather smaller than those of



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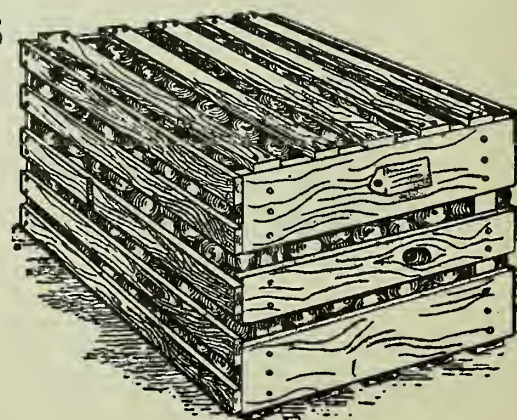
Our Cement Coated Nails are always of uniform length, gauge, head and count. Especially adapted to the manufacture of fruit boxes and crates. In brief, they are the Best on the Market.

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last year. The harvesting season opens in the latter part of September.

The price for shelled walnuts, not picked and not graded, was about \$2150 Mexican per picul (\$1 Mexican=\$0.90 gold, and 1 picul=133½ pounds) for the 1918 season. The price for walnuts in shell, average quality, but not graded, was approximately \$11 Mexican per picul.

Walnuts are, as a rule, grown on small farms, owned by individual families. Harvesting is usually done by members of the family, so that it is impossible to calculate the cost of such labor. It may be stated, however, that labor of this class costs about 20 cents a day.

There has been no recent development in the walnut industry; but owing to the greater demand for export there may be increased efforts to greater output. The trees take nearly 15 years to bear. Walnuts are grown over a very large area in North China and come mostly from Shantung, Shansi, and Chihli provinces. The groves in most cases are located on the mountain slopes and hill side, on land not particularly adapted to the growing of other crops.

According to the returns of the Maritime Customs, the export abroad of walnut kernels from Tientsin in 1918 amounted to 2,475,867 pounds, valued at \$263,437, as compared with 968,800 pounds, valued at \$97,252 in 1917; the exports of walnuts in shell amounted in 1918 to 3,178,933 pounds valued at \$160,377, as against 4,863,333 pounds, valued at \$184,154 in 1917. According to the annual declared export returns of this consulate general shipments of walnuts, shelled and unshelled, to the United States amounted to 1,183,640 pounds valued at \$339,718 in 1918, compared with 2,830,646 pounds valued at \$493,239 in 1917.

A Distinctive Book

It is decidedly refreshing to turn the well printed pages of the new 1920 seed catalog just issued by the Chas. H. Lilly Co. Without doubt it is one of the most attractive books of its kind that has come before us, and we do not remember ever having seen better printing in any of the seed catalogs either for this or any previous year.

The cover is at once original and unique in its simplicity of design. It is an imposing, dignified, yet attractive volume externally, it gives all the information and explanatory notes which should be given in relation to seeds for garden and field; poultry and bee supplies, fertilizers, etc., while its excellent illustrations adorn and make clearer its arguments. It also contains four beautifully colored photo plates which are more truthful to type than anything we have seen hitherto.

Altogether the Lilly seed annual for 1920 is worthy of a place on the gardeners' bookshelf. A postal request addressed to Seattle or Portland will bring a copy free.

Protect Your Tools From Rust.

Nearly every man owns at least a few tools such as chisels, hammers, augers, saws, wrenches, files, etc.

These tools as a rule are infrequently used. They are often kept in places where they are exposed to moisture and consequently rust. Almost all tools with the possible exception of hammers are rendered less efficient by rust.

Probably the best tool protector and carrying case for a small kit may be made in the shape of a roll from a piece of pyroxylin coated fabric having a napped or fleecy back. This material is thoroughly waterproof and if care is taken in wrapping the tools in it after use, it will prevent moisture from reaching them and no damage from rust can occur.

Nice Bright Western Pine

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Good standard grades. Well made. Quick shipments. Carloads or less. Get our prices.

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Fruit trees budded from bearing orchards. Apple, Pear, Cherry, Peach, Plum, Prune, Apricot, Quince, Grape Vines, Shrubbery, Plants, Raspberries, Blackberries, Logans, Dewberries, Asparagus, Rhubarb, Flowering Shrubs, Roses, Vines, Hedge, Nut and Shade Trees. Carriage paid. Satisfaction guaranteed.

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It is the result of ten years of study,
Comparison, test and proof—not only
In this country but abroad—under many
And varied conditions, for the control of
sucking insects such as scale, aphids, mealy
bug, red spider, thrips, and the stimulation
and renovation of trees in general.

It will remove black fungus, moss and
lichens, and produce clean, smooth bark
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ZENO is an internationally used
spray and these are some
of the reasons why it has proved the best
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SPOHN & WING

NORTHWEST AGENTS

223 Sherlock Building Portland, Oregon

Some Wet Spots Drained by Dynamite

By A. H. Harris

A neighbor had an old low pond place of about one-quarter acre in his upland field, which, owing to the nature of the land could not be drained by an open ditch. Therefore the only way of draining it was by an underground outlet. He drilled several holes in this piece of ground about twelve feet deep and exploded from 2 to 3 pounds of 40 per cent dynamite in them. These explosions thoroughly broke up and shattered the hard pan so that the water could escape downward. The next year a much larger yield was harvested from this piece of ground on account of better drainage.

Another man had a very low piece of land. This was drained by using one-half pound of 20 per cent dynamite ex-

ploded at a depth of 3 feet. A few of the latter charges in the lower places were planted a little deeper and charges were made a little heavier. The tough, underlying subsoil was thoroughly broken up, allowing the surplus surface water to escape downward. He too, has harvested considerably better yields every year.

Last spring I subsoiled a piece of ground which was of a very cold, wet nature. The soil was so wet that the ground could not be put in good condition for an early crop. The past year three crops were grown on this piece of ground and all good ones. The soil has worked much better since being drained by the blasting.

For this work I used farm powder. These holes I put down about three feet apart and used one-quarter pound of the farm powder per hole.

A few large, deep basins have been successfully drained by driving a well until a sandy or gravelly stratum or a stratum of rock with cracks in it is reached. Dynamiting to drain wet spots and basins with no outlets can only be successful in a type of soil where a well would also be successful. As it is much cheaper it is preferable where the sandy, gravelly or rock stratum with cracks in it is near enough the surface that the explosion would open up pass-ways to this stratum. Where clay subsoil extends down as far as the blast would affect the soil no permanent good can be expected from dynamiting and the blast must go below this clay to an easily pervious stratum to get the desired drainage. Then such holes should be filled with long poles, stump wood or other rubbish to keep the soil from running back together afterwards, making absolutely sure of a permanent drainage system.

New Mexico Fruit Shipments

The fruit season for the Pecos Valley, Roswell district of New Mexico, was on the whole a very successful one. About 150 cars of peaches were shipped out, chiefly to middle west and northern markets. Eight hundred and forty-one cars of apples were shipped and about thirty remain in local cold storage.

Jonathans started to move about August 20th and the entire crop was harvested by November 10th.

As usual the bulk of the crop was marketed in Texas, although some of the early Jonathans went to New York, and the middle west and Great Lakes territory took a larger percentage than in former years. Prices were good and orchardists will use greater care in packing and grading next year.

Peach Leaf Curl Tests.

The first of a series of leaf curl control tests has been made on the Oregon Agricultural college station farm by W. A. Smart, crop pest assistant. The purpose of the tests is to determine the best materials to use, and the best time of year to make the spray applications. November sprays are not recommended by the college at present, but applications in December, January and early February are safe. Former tests have shown that March is too late and that Bordeaux is superior to lime-sulphur for this disease.



YOUR party, dance, social or club session calls for refreshments—and there's one unfailingly successful beverage—Ghirardelli's. Creamy, delicious, fragrant—it's an instant favorite with or without cakes or sandwiches. Better than all, Ghirardelli's is made in a jiffy!

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In ½ lb., 1 lb. and 3 lb. sealed cans—
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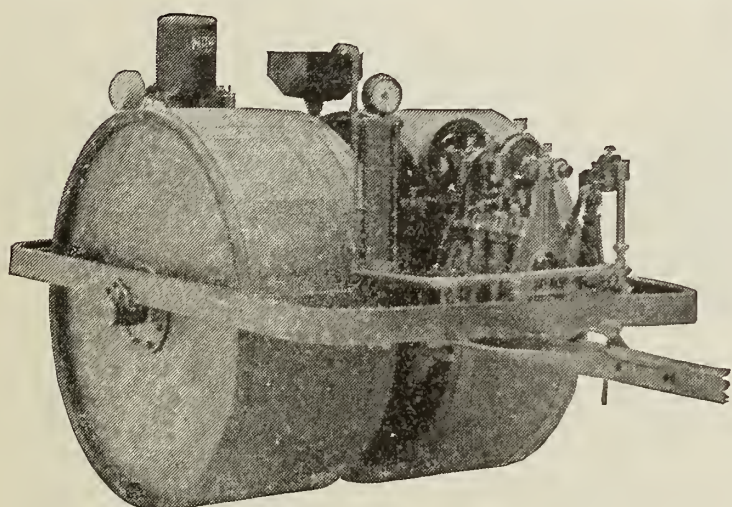
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Manufactured by Bean Spray Pump Co. in their Lansing, Michigan factory for service in the sand dunes of Florida.

North, east, south, west—in this country or across the seas—

BEAN Power Sprayers are, each season, adding to an already favorable International reputation.

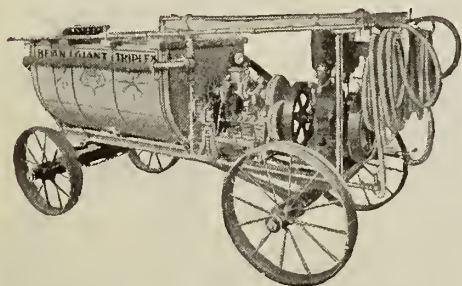
To build sprayers as good as they can be built and in construction and principle adapted to the specific needs of growers in certain sections is our aim, and in practice our accomplishment.

We have a sprayer for every need and in these days no grower can afford to grow fruit without Bean Equipping his orchard.

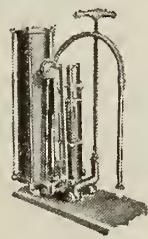
Write for our catalog today, describing the Bean line. It includes our new Simplicity outfit. If you have five acres or fifty you need a Bean sprayer. If your orchard is in South Africa or California there is a Bean fitted to your particular needs.

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318 West Julian St., San Jose, Cal. 39 Hosmer St., Lansing, Mich.



Bean Giant Triplex Sprayer



Bean Magic Spray Pump



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Bean Spray Pump Co. 318 W. Julian St., San Jose, Cal.
Gentlemen: Without obligation to me send me
your catalog No. 33.
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VENTILATED Sublimed Sulphur—Impalpable Powder, 100% pure, in double sacks, for Dry Dusting and making Paste—Sulphur.

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Also PREPARED DRY DUSTING MATERIALS, Tobacco Dust, Dry Bordeaux, Dusting Sulphur Mixtures, etc.

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Japan Iris, new hybrids, all colors. Magnificent.

Giant Centaurea, superb for garden or vases.

And our Big Catalog, all for 20 cts.

Big Catalog, free. All flower and vegetable seeds, bulbs, plants and new berries. We grow the finest Gladioli, Dahlias, Cannas, Irises, Peonies, Perennials, Shrubs, Vines, Ferns, Peas, Asters, Pansies, etc. All special prize strains, and many sterling novelties.

JOHN LEWIS CHILDS, Inc. Floral Park, N.Y.

The Orchard Business in Southern Indiana

From a Special Correspondent

THE possibilities of the orchard business in Southern Indiana are realized by only a few of our farmers, therefore it will be interesting to western fruit growers to know what can be accomplished in this industry here.

We have the available land, which will produce fruit, with the color and flavor, if given attention, as is shown by the number of premiums, our apple growers in Knox and Daviess County take each year at the Indiana State Apple Show.

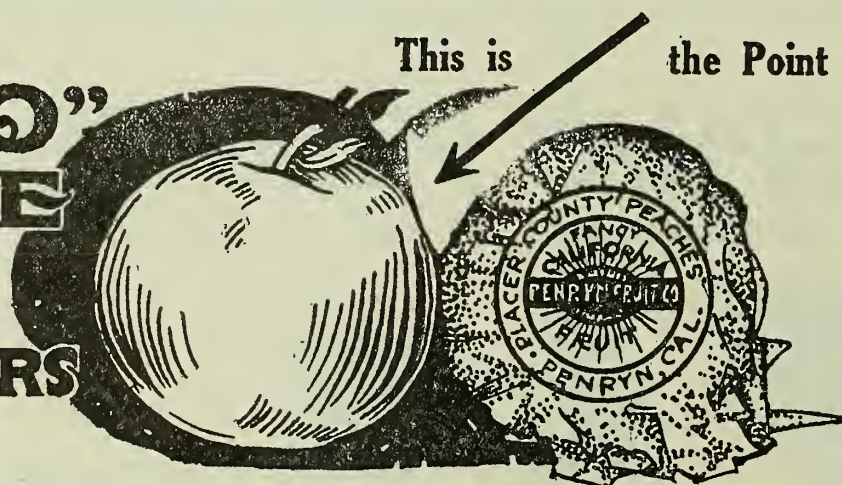
We have in this section one of the best paying apple orchards in the State of Indiana, and perhaps in the United States. It belongs to Allen Harbin, and is located 7 miles from Washington, Ind. Mr. Harbin was not an experienced orchard man when he took this orchard over, some six years ago, but he observed from careful study the possibilities of this orchard, if given good care and attention. Part of this orchard was 40 years old, and part of it 22 years old, there being 8 acres of it, set with the Old Fashioned Winesaps and Mammoth Black Twig. The orchard had never been cared for, but was just allowed to grow. It had never been pruned or sprayed; so Mr. Harbin started by first cleaning it up, then pruning and spraying it. He cared for it according to the instructions of the Purdue University Bulletins, together with the hints and advice he could get from practical orchard men. Today he has a well cared for orchard, and one that is perhaps making him more clear money, than any other orchard of its size in the State of Indiana. This year he sold his apple crop for \$8,000 and his cost of pruning, spraying, spray materials, plowing, discing and the harvesting of the crop was \$2,400, leaving him a net profit of \$5,600 on 8 acres or \$700 per acre. What other crop will bring a net profit of anything like this?

Three years ago Mr. Harbin had a good crop of apples, but the price was not quite so high, yet his net profits per acre were \$450. Last year the crop was small, but he had a nice profit left, after all his expenses were paid.

Mr. Harbin is an apple grower that does not believe in doing things by halves; so three years ago he decided that in order to get the best results from spraying it would be necessary for him to get a power sprayer. He purchased one and has sprayed his orchard six or seven times each year since getting this spray pump, and his apples certainly show the effects of good spraying for they are 90% free from worms or disease. First, Mr. Harbin sprays in the fall for the scale after the leaves have dropped off and the trees are in the dormant stage, with a very strong solution of lime-sulphur. The next spray is for the scab and green aphid, applied just as the buds begin to turn pink, for this spray he uses lime-sulphur, arsenate of lead and Black Leaf 40, next he sprays after the petals fall with the lime-sulphur and arsenate of lead, to control the codling moth, late scab and curculio. In years favorable for scab infection, he puts on a follow-up spray ten days later, using lime-sulphur, arsenate of lead. The fourth summer spray is three weeks after the petals fall to control the blotch. This spray is repeated five weeks after the petals fall. The last spray is usually ten weeks after the petals fall for the second brood of codling moth.

In the fall of the year, before the weather gets too bad, Mr. Harbin plows his orchard to the depth of 4 to 6 inches and in the spring double discs it both ways, and harrows it twice, then he sows it in Red Clover, thus keeping as much moisture in the ground as possible. The appearance of his orchard

"CARO" FIBRE FRUIT WRAPPERS



Chemically Treated
"Caro" Protects

"Caro" from DessiCARE (to dry up)

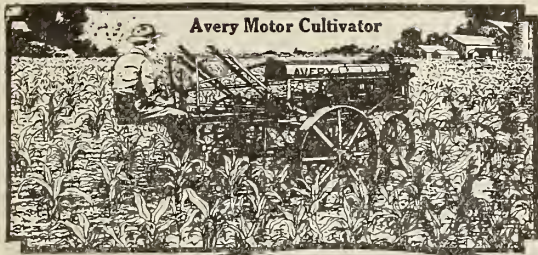
"Caro" Prolongs the Life of Fruit Why?

Fruit decomposition starts from a bruise which opens tiny holes and permits the juice to escape and BACTERIA to enter.

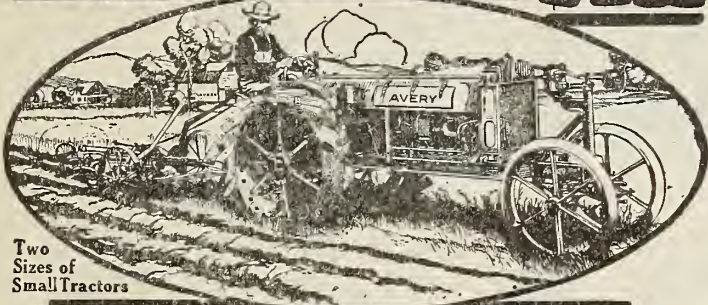
"Caro" clings closely and dries up the escaping juice. "Caro" ingredients harden the spot, kill the BACTERIA, arrests the decomposition—and thus **PROLONGS THE LIFE OF FRUIT**. If your fruit is worth shipping it is worth keeping in best condition.

Demand "CARO"—Wrap Your Fruit in "CARO"—The Fruit Buyer Knows "CARO"

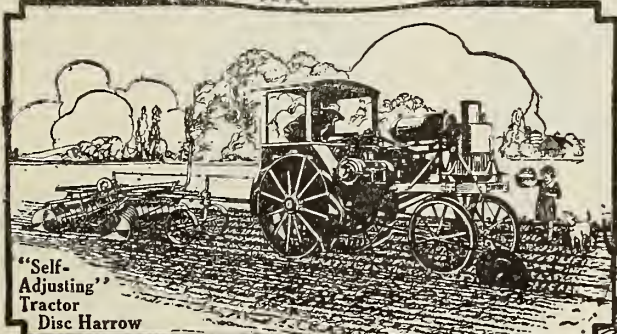
Order from Any Fruit Company or American Sales Agencies Co., 112 Market St., San Francisco



Avery Motor Cultivator

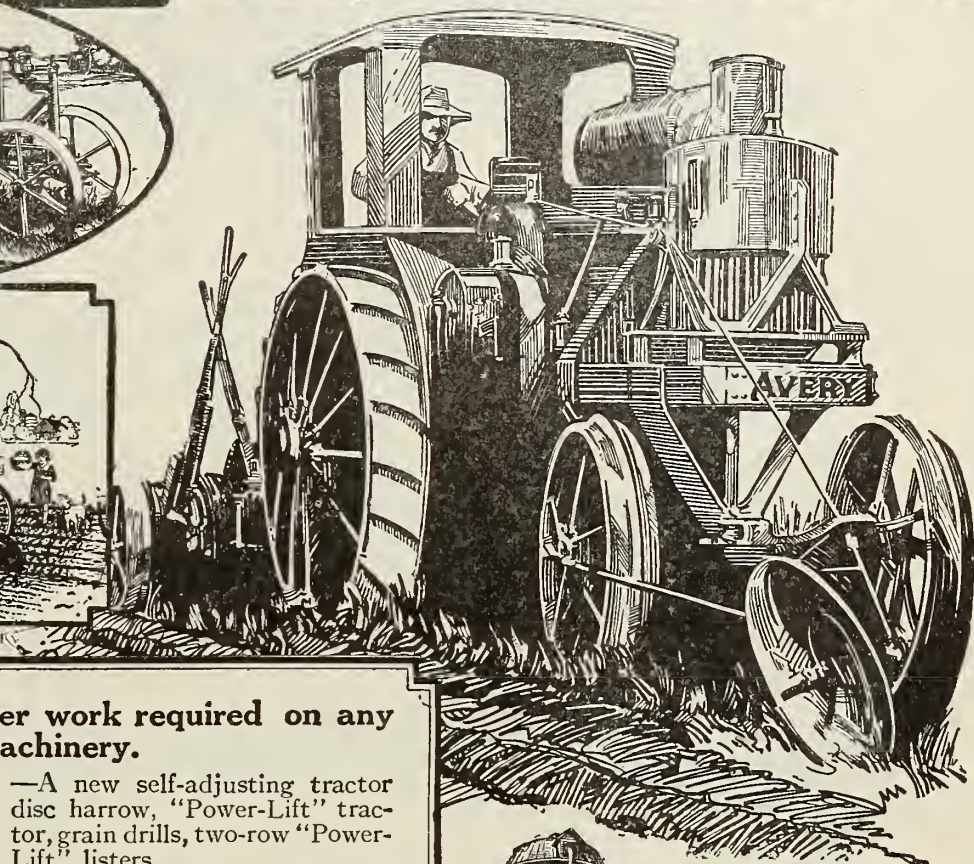


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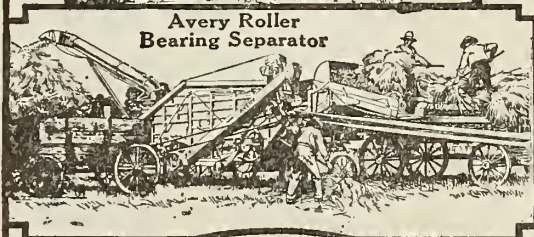
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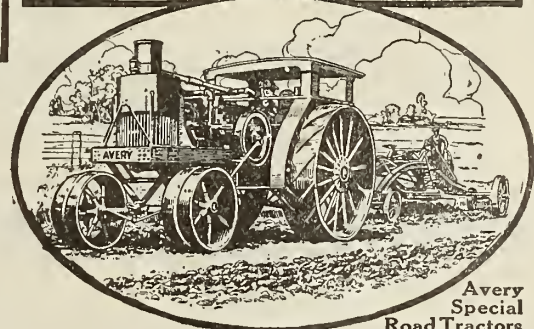
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in the spring reminds one of a well-prepared garden.

Two years ago Mr. Harbin put three

tons of limestone per acre on this orchard, and last year he used 300 pounds of nitrate of soda per acre. This,

together with what barnyard manure is produced on the place is the fertilizer used. His trees have very heavy foliage this year and great vitality due to the fact that much fertilizer had been used. The frost last spring had very little effect on this orchard, while some of his neighbors, who do not spray, cultivate or take care of their orchards have not enough apples for their own use.

Had it rained in the early part of July this year Mr. Harbin's orchard would have produced possibly 300 barrels of apples more, on account of the increased size of the apples.

Mr. Harbin is not a young man, but is nearing 70 years of age, yet he looks after the general work of the orchard and directs his men what to do and when to do it. Mr. Harbin says that his only regret is that he is not 20 years younger, for he sees the possibilities of the orchard business.

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The increased cost of farming makes necessary the careful selection of seeds—improved varieties that produce profitable crops.

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IN THE DISTRIBUTION OF
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APPLES
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What the U. S. Supreme Court is to American law, the American Pomological Society is to American fruit.

This society (composed of the foremost fruit authorities of the entire United States), at its 1920 meeting gave to the Golden Delicious apple the highest award ever given by it to any fruit variety in its 75 years' history—the *only* Wilder Medal (see cut of medal below), with one exception, ever given to an apple during the last 25 years.

The Wilder Medal (provided for by a Trust Fund left by the late Marshall P. Wilder, who for 38 years was President of the American Pomological Society) is awarded only after exhaustive investigation and only after absolute proof of a fruit's supreme merit has been produced. It is the "Nobel Prize" of the fruit world—the

American Pomological Society's Highest Honor

And when this authoritative body has thus placed its stamp of approval on this apple, it means that this Golden Delicious apple is a truly great fruit achievement. To all who have been waiting to see the Golden Delicious "prove itself," here is indisputable proof. Here is the evidence of the esteem in which this Queen of all Golden Apples is held by the leading pomological experts, horticulturists and orchardists in all sections of America. It is assurance to you that you will profit by planting this great, glowing golden fruit.

Stark's Golden Delicious

Golden Delicious apples, actual size and natural coloring—bearing 18 months after top-grafting.

Highest
Award
—1920



The Famous \$5,000 Golden Apple

which we discovered years ago flourishing and bearing bumper crops of finest apples, on a barren West Virginia mountainside. We immediately bought this remarkable tree for \$5,000—the highest price ever paid for a single tree—and have for years propagated young Stark's Golden Delicious trees from "the wood" of this original tree.

The apples they bear are easily the finest yellow apple we have ever seen or eaten in all our 104 years of nursery and orcharding history. Superior to even Grimes' Golden in appearance, size, flavor and quality. Vastly superior in keeping quality—keep four months longer. Fill the Grimes' Golden demand long after that apple is rotted and gone from the markets. One of the leading members of the American Pomological Society, Prof. J. C. Whitten (for 25 years Dean of Horticulture, Missouri Agricultural College, now Prof. of Horticulture and Forestry, University of California) writes:

"I have never eaten an apple coming out of storage this late (July 15th) which retained so fully its normal crisp, juicy condition as does Golden Delicious."

Orchardists and owners of home orchards everywhere are planting Stark's Golden Delicious this year.

We're Planting It by the Thousands in Our Own Orchards

Wilder
Medal

Members of our firm have carefully watched the Stark's Golden Delicious tree and its superb fruit in test orchards all across America. During this and last season we have made especially big plantings of this tree in our own personal orchards. In fact, it is the "backbone" of our own

commercial fruit-raising farms. That shows what we think of it! We are doing this because, like J. L. Webster, the well known Wenatchee, (Wash.) grower, we know that "the Golden Delicious is a strong grower and heavy bearer. Its apples do not drop. Keeping quality equal to old Winesap. Eating quality equal to Stark's Delicious. It will surely excel in world's apple markets."

Learn All the Facts—Get Free Copy of "Prize Fruits"—Send Coupon TODAY

Whether you plan to plant only a few trees for a home orchard or a big commercial orchard, it is your duty to yourself to get posted on Stark's Golden Delicious and all Stark Bro's Apples, Peaches, Pears, Plums, Grapes, Cherries, Berries, Garden Roots, etc.

Send your name and address on the coupon—or a post card—for a Free Copy of this great big 72-page Catalog showing our Prize Fruits in Nature's own colorings. Do this today.

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104 Years of Nursery and Orcharding Experience

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